

THE HOUSE FLY

A SLAYER OF MEN

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BY

F. W. FITZSIMONS, F.Z.S., F.R.M.S., &c.

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FIG. 1.

THE HOUSE FLY (*Musca domestica*). This fly is now known to be the principal carrier of the microbes of infectious diseases to man.

(This picture is from a model by Mr. Ignaz Matusch in the American Museum of Natural History. Every part of the fly was modelled exactly to scale, and it was the product of nearly a year's work.)

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WITH ILLUSTRATIONS

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INTRODUCTION

FOR some years it has been common knowledge to men of science that the insect known to everybody as the *House Fly* is a carrier of the microbes of infectious diseases, and that through its agency disease germs are conveyed from sick to healthy people in dwellings, as well as from house to house.

Entomologists, Zoologists, and Bacteriologists during the past few years have specially studied this insect, which has, in the past, been regarded merely as a nuisance by reason of its obtrusiveness.

The outcome of these researches is that we now know the House Fly to be the principal carrier of the germs of infectious diseases from the sick to the healthy.

In the United States of America most of the governing bodies are now alive to the necessity of taking drastic measures to diminish the numbers of these terrible flies, and also to the extreme urgency of educating public opinion on the subject.

Diseases which afflict humanity would be reduced by at least two-thirds if the microbe-carrying House Flies were exterminated! For some years I have conducted campaigns in the Public Press on the necessity for taking active measures against this universal pest, which is mowing down the flower of our race.

Public men, school teachers, and others have repeatedly urged me to write a small book of a popular nature on this subject, which would be within the financial reach of everybody, and this little volume is the outcome of that desire.

THE AUTHOR.

PORT ELIZABETH,
May 1915.

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THE HOUSE FLY

CHAPTER I

MICROBES are the cause of disease and premature death in man and beast. There are great numbers of kinds or species of microbes. Those known as disease-producing microbes are like a watchful hostile army, ever ready to deliver an attack. Ever since the discovery of these terrible little fellows, which are so small that it requires a high-power microscope to see them, men of science have been waging war against them. For untold generations disease microbes have worked their will on man and beast, for their very existence, owing to their invisibility to unaided vision, was entirely unsuspected. Knowing not the originating causes of diseases, those who sought to cure them invariably either killed their patients, or else left them with damaged constitutions.

However, that is a thing of the past. We now know the originating causes of most of the diseases which attack both man and beast. Whenever a new form of disease appears, our men of science immediately set themselves the task of tracing the cause, knowing that before the enemy can be outflanked he must be located. Then the bombardment begins. The battle is often fierce and long, but in all the fights so far put up against the disease microbe army, we have steadily gained ground.

Alas ! that it should be so, but the people whose lives are at stake stand by and heed not, feverishly chasing the will-o'-the-wisp of so-called pleasure ; and to secure the money to continue the chase, they shut out all that matters from their minds. They heed not when men of science tell them of the terrible dangers they run of disease and premature death. " Eat, drink and be merry," say they, while the microbe army hovers around claiming its victims in millions.

It would matter little or nothing to posterity if they alone were eliminated, but the pity of it is that it does not end there.

" The sins of the parents are visited on the children, even to the third and fourth generation." This apparently seems distinctly cruel and unjust. It is, however, a law of Nature, and we must submit. It lays a terrible, an awful responsibility on parents, for both physical and mental weaknesses are transmitted to the children. Active disease is not handed on, but the tendency to it is. If both parents have the consumptive tendency, then it is inevitable that the children will be specially liable to contract tuberculosis and die of it. Abuses of the various parts of the body react most disastrously on the children. Traits of character are similarly handed down.

It is the parent who is determining the future destiny of the race for good or ill. The human race can be improved as easily and as steadily as the experienced stock farmer improves his stock. Disease of the mind can only be stamped out by practising self-control in all things ; and by educating the higher brain centres. We are here concerned, however, with physical disease. This can be elimi-

nated with brains—educated brains. The only difference between man and the lower animal is that he has a larger and a heavier brain. A man who exists merely for the gratification of his animal instincts and emotions is not human. Humanity has no use for him, nor has Nature, for this animal gratification invariably leads to excesses which make it possible for disease microbes to attack and destroy him.

Our duty to ourselves, our children, the community and the State, is to learn all we can about diseases and apply such knowledge in a thorough and practical way. Ignorance of man-made law is no excuse for committing crime ; nor is deliberate, studied ignorance of the laws of hygiene and health any excuse for the disease and premature death brought about in others in the home, and in the community in consequence.

Our first duty is to ourselves—to live clean, wholesome lives both mentally and physically ; our second duty is to our children, to see that they are trained in a like manner ; and thirdly we owe a distinct duty to the community, and should each do our little best for the general welfare. In this, the humble insect sets us a noble example, and in this respect it is ahead of us.

Disease microbes produce disease according to their kind. No particular kind or species of microbe can infect a man or beast with more than one type of disease. Now, before these formidable little fellows can do us any harm they must get into our bodies. They cannot deliberately crawl or eat their way into us. They must in some way be carried to us. We get them on our hands, and from there they are carried to our mouths. People suffering from disease kiss

each other on the lips and cause infection. Schoolboys and girls suck pencils, pens, and use the mouth as a temporary pocket for marbles and sundry other substances. Others breathe through the mouth and get microbes into their lungs, or swallow them into their stomachs. Unclean mouths are favourite nursery grounds for microbes. The scraps of food around the roots and between the teeth are excellent breeding beds where many kinds of microbes thrive, which in a few hours increase and amount to many millions. To prevent this, the mouth should be cleansed with a good dentifrice after each meal, and not a morsel of food should be eaten at night after the final cleansing. It is during the hours of sleep, when the salivary secretion is inactive, that microbes breed without hindrance in the mouth.

The greatest ally of the disease microbe is the common House Fly, which scientific men call *Musca domestica*. The object of the preceding remarks was to pave the way to a series of chapters on this dreaded House Fly, which is the chief carrier of disease microbes, and the indirect cause of most of the diseases in man and his domestic animals. If a few score of venomous snakes accidentally escaped in a town, there would be a profound sensation, and a sense of insecurity of life would be ever present until they were destroyed. Yet the presence of five hundred cobras scattered throughout a city would be as nothing in comparison to the awful, the appalling danger and risks incurred by the presence of the common House Fly.

CHAPTER II

“ HE who laughs last laughs best ” is a saying familiar to all. It has a deeper meaning than most of us are inclined to believe. Since the time when ape-like men began to chip stones and use them for weapons and tools, there have been those who have laughed at the efforts of their more progressive fellows, and in consequence brought disaster upon not only themselves, but frequently the entire tribe. It is a strange thing, but nevertheless true, that the acquisition of practical knowledge is distasteful to the majority of people, except when its acquirement means the securing of money or other forms of material wealth. The man who limits his knowledge to those subjects which enable him to make money, is like the man busily employed sifting gold-bearing sand in a dry creek in a gorge, utterly blind to a gathering storm in the distance which will presently convert the creek into a vast torrent and sweep him and his money-making apparatus to destruction.

When it is stated that the House Fly carries disease and death to man and his domestic animals, there are many who laugh and joke in derision. If they only realised that, possibly, at the very moment of their merriment, flies were infecting the milk with the germs of tuberculosis or some other serious disease which is going to rob their households of one of their loved ones, their faces would blanch with apprehension and fear. There is a saying, “ where ignorance

is bliss 'tis folly to be wise." This may apply in some instances, but not in matters of life and death such as the one at present in hand. If the Disease Microbe and his ally the House Fly can laugh, then they will be laughing all the time at our blind wilful ignorance of the fact that they are playing havoc with the health and lives of our species. The innocent little baby in its cradle and the hardened sinner are alike attacked. The microbe spares none, whether he be a waster or a righteous man.

We are surrounded by forces which seek to destroy us and all other forms of life upon this world. It is a law of Nature that if an organ is not used it either becomes modified or is eliminated. Man has, so far, evolved to the position he holds to-day because his environment was of a nature which forced him to constantly use his brains.

If the disease microbes have done no other good, they have at least been the means of stimulating the human brain to find out ways and means to repel their attacks. The man who uses his brains exclusively for money-making, or who does not use them at all, except perchance certain of the lobes which give rise to various animal desires, is usually he who acts as a clog upon those who desire to apply in a practical way the various important discoveries of scientific men. Not realising the necessity of reform, such men put every possible obstacle in the way of their fulfilment.

We all know, or should know, that most forms of disease are produced by microscopically small forms of life known as bacteria or microbes ; but what most people don't seem to know is that the House Fly is the principal carrier of these disease microbes. Certain kinds of ticks carry the

microbes of various animal diseases to our stock, and in consequence we are making strenuous efforts to kill these ticks by dipping, burning the herbage, preserving bird life, &c. ; but so far, at least in this country, we have done little or nothing to kill the fly which is sowing disease and death in town, village, and kraal.

The House Fly lays about 150 eggs on dung, in garbage heaps, and in all kinds of decaying vegetable and animal matter. The eggs hatch out into tiny white grubs, usually



FIG. 2.

EGG OF A HOUSE FLY. Batches of 150 and more are laid in garbage heaps and any other kind of animal and vegetable filth. (Enlarged.)

(From the National Geographic Society, Washington, D.C.
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in about twelve hours ; these at once begin to feed greedily on the decaying refuse or stale meat, as the case may be.

In from five to eight days, in favourable conditions, the maggots are fully developed and immediately change into the chrysalis condition. In another week, sometimes less, they issue forth as full-grown House Flies. These in the course of a few days lay batches of eggs, and so the cycle goes on. In mid-summer the whole life cycle only takes about ten days. A single fly can in one summer season be the progenitor of countless billions, each of which is capable of carrying from one to many thousands, and

even millions of disease microbes from infected matter to our food substances.

On the approach of winter most flies die of cold. Others hibernate in houses and other warm situations. On the approach of the warmer season they again start their chief business in life, which is that of laying eggs, and incidentally transferring the microbes of diseases to our food material. If every hibernating fly was killed during the winter months

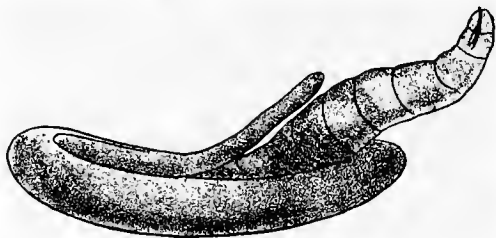


FIG. 3.

EGG OF A HOUSE FLY, showing the larva or grub issuing forth. The maggot devours decaying animal and vegetable filth, and in a week's time turns into a chrysalis. (Enlarged.)

*(From the National Geographic Society, Washington, D.C.
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in dwellings by suitable fumigation, the plague of flies the following spring could be considerably checked.

A single female fly is capable of laying four batches of eggs before she dies, although numbers of them die shortly after laying one batch.

Now, supposing a female fly has survived the winter in some crack, behind a picture, or loose wallpaper in a dwelling house, and issues forth in the spring. She instantly

attacks some food material and gorges herself. Then after mating she, in a few days' time, seeks out the manure heap,

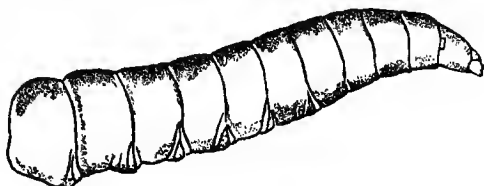


FIG. 4.

THE FULL-GROWN LARVA OR GRUB OF A HOUSE FLY.
(Enlarged.)

the garbage box, a pile of decaying leaves, or any form of filth which might be in the neighbourhood, for her sense

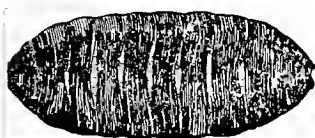


FIG. 5.

THE PUPA OR CHRYSALIS OF A HOUSE FLY,
showing back and side view (enlarged).
Within a week after the grub becomes a pupa
or chrysalis, a full-grown fly emerges.

(From "*The House Fly*," by L. O. Howard. Published by
Mr. John Murray, Albemarle Street, London.)

of smell is extremely acute. Laying say 150 eggs, she departs. Supposing these eggs all hatch and eventually

emerge as adult flies, which are allowed to breed unchecked ; then the progeny of that single fly will amount to something like 6,488,560,000,000. Sometimes the original parent dies after laying one batch, but as likely as not she will lay two or three more batches of eggs. If she does, then these figures must be multiplied by three. Work it out and the total will stagger the imagination of even an astronomer.

When it is remembered that one half of this total are female flies, and that to kill a few flies in the springtime is equal to destroying many billions in the autumn, then we should be up and doing. Remember every fly you kill in the early springtime, prevents not only an uncountable swarm later, but you may be the means of saving many of your fellows from disease and death.

Kill and spare not. Wage unceasing warfare against flies. Try to imagine that every fly which crawls over your foodstuffs has the germs of some disease upon it, and that these germs are being transferred to your food, where they will immediately begin breeding. Be merciless in this respect. Teach your children also to kill and spare not, but be particular to instruct them carefully why they are required to destroy flies, lest they should develop a love of killing for sheer wantonness.

CHAPTER III

IN the preceding chapter we have learned how the House Fly lays its eggs, how those eggs develop into white maggots, and how within a few days they change into the chrysalis condition and emerge as full-grown House Flies. The adult fly is wonderfully constructed, and, like all the works of Nature, it is perfectly adapted for its mission in life, which is chiefly that of a scavenger. It is this very fact which causes the House Fly to be dreaded by man. It breeds in filth of the foulest nature, it wallows in it, and it feeds on it.

The mouth parts of a House Fly are constructed for sucking purposes, and it is consequently unable to bite or puncture the skin, as can its relative the blood-sucking fly. The six feet of the House Fly have each two claws, and in addition on the foot of each is a soft pad thickly covered with fine hairs, which secrete a sticky substance that enables the fly to walk upside down or upon highly polished surfaces such as window panes. The entire body is covered with coarse bristles, giving the magnified body of a fly a most repulsive appearance.

Knowing the structure of the fly and its habits, it can clearly be realised how it can carry the microbes of disease. On emerging from the chrysalis the House Fly instantly sets off on a quest for food. It is provided with an acute sense of smell, and decaying vegetable and animal matter has an irresistible attraction for it. Visiting the garbage box and

all kinds of unmentionable filth, it settles upon it and greedily feeds. If it should be a female desirous of laying a batch of eggs, she burrows into the horrible microbe-laden mass, and after carefully depositing her precious eggs, she, with others of her kind, wing their way to the nearest dwell-

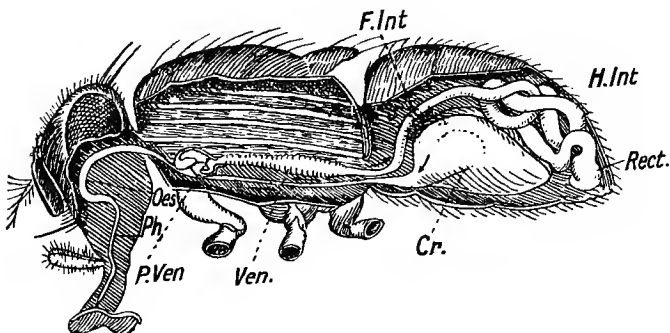


FIG. 6

A DIAGRAMMATIC FIGURE OF THE HOUSE FLY, showing the proboscis or sucker; the large crop from which food is regurgitated; the true stomach, and the intestines. Ph., Pharynx. Oes., Oesophagus or Gullet. P. Ven., Proventriculus. Ven., Stomach. F. Int., Front Intestine. H. Int., Hind Intestine. Cr., Crop. Rect., Rectum. The digestive juices of the fly are too weak to kill disease microbes, so they pass through the fly alive, or are regurgitated from the crop.

(From *National Geographic Magazine*, Washington, D.C.
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ing-house to seek shelter from the wind and rain, and to sample the foodstuffs of the dweller of that house. A single House Fly is capable of carrying many millions of the microbes of any disease upon it, without inconvenience. If the filth on which the fly has been feeding, or in which it has laid its eggs, is infected with disease germs, as it in-

variably is, then hosts of these terrible destroyers of human life cling to the sticky pads on the fly's feet ; on its large, soft proboscis ; on its legs, bristles, and wings. In fact it may be smothered with a vast mass of disease microbes, as well as the putrid filth on which it has fed, and in which it has wallowed.

We are aware how House Flies swarm over our foodstuffs, drown themselves in our milk, soup, and tea, and sometimes get mixed up with our puddings and pass as currants. Therefore, knowing how the fly becomes covered with disease microbes, any child can understand how those microbes are transferred to our food and drink. Flies have been carefully observed by scientific men in the most painstaking manner. For instance, flies have been captured at random, and with the aid of a powerful microscope the disease microbes have been examined on them, and even counted. Thus it is known that the majority of flies have from a dozen to millions of disease germs on one or more parts of their bodies. Flies have been watched, and after wading across some choice morsel of food on the dining table, this food material has been carefully examined, and in the track of the fly a line of disease microbes, in many instances, was found. After a few hours it was noted that these disease germs had multiplied and formed great colonies.

Then milk was taken and carefully sterilised to destroy any microbes which might have been in it. A fly was caught and examined, and if found to have microbes on it, its body was dropped into the milk. The milk was set aside for some hours, and when tested was found to be swarming with the germs of one or more diseases. The microbes,

finding the milk an excellent material on which to feed, forthwith began the process of multiplying with their usual lightning-like rapidity.

The object of this book is to get people to realise that in allowing the House Fly to breed and live in their community, they are harbouring an enemy of the most terrible kind—an enemy which carries the infection which causes sickness and death in our homes. Therefore no apology is tendered for using the plainest of language. It is a daily sight to see Kafirs, low-class Europeans, and others suffering from tuberculosis, bronchitis, influenza, syphilis, &c., expectorate yellow phlegm in the gutter and road, and to observe House Flies swarming around and on it. After walking through and wallowing in these masses of filth, teeming with microbes, the flies take wing and enter the nearest open window or door and make straight for the foodstuffs on the dining-table, kitchen, pantry, shop counter, or shelves, leaving not only a trail of this horrible filth on the food material, but actually infecting it with the microbes of disease. Yes, a disease too, which may fasten itself upon the lungs and cause consumption ; or it may be the bowels or even the bones, inducing consumption of these parts, and death after a long, lingering illness.

There are many ways of carrying infection from house to house. Scarletina, enteric fever, pneumonia, tuberculosis, or any of the common diseases which work havoc in every community of men, may perchance have claimed a victim who lies in the grip of the disease, his bodily forces fighting desperately against threatened death. The House Fly walks and flies merrily round the sick room, sucking up infected matter and collecting it upon the sticky pads on



FIG. 7

The white dots on this disc represent the tracks of one House Fly which was allowed to walk over a small plate covered with gelatine. A few hours later forty-six million germs of typhoid, diphtheria, tuberculosis, and pneumonia were counted.



FIG. 8

ENLARGED FOOT OF A HOUSE FLY, showing the claws, hairs, and sticky pad to which disease microbes adhere, often in millions.

(Sketch from illustration in "*Insects and Disease*," by Rennie W. Doane. Published by Henry Holt and Co., New York.)

the soles of its feet, or upon the hairs which cover its body. A savoury smell from a neighbouring kitchen is wafted through the open window. Instantly a score or more of flies, laden with disease germs, take wing and track that smell to its source. Flies are constantly migrating from house to house and incidentally carrying disease microbes over the entire neighbourhood. Ever and anon they make excursions to the various garbage boxes, the decaying carcasses of dogs, cats, fowls, privies, latrines, manure, pigstys, foul expectorations and excreta of animals on the roads, &c., and wing their way back to the shelter and permanent food supply of the dwelling-houses of their human-folk victims.

Contrary to general belief, it is not necessary for food to be in a more or less liquid condition to be available for a House Fly to feed upon it. Finding some foul filth in a dry condition, it exudes a droplet of saliva from the end of its proboscis and so moistens the food material and then proceeds to suck it up. This can at any time be observed by watching a fly eating a crystal of sugar.

A fly after greedily sucking up filth from the garbage box, the street, or the lavatory, comes sailing into a dwelling, alights on a cake, a loaf, the cheese, or some other foodstuff, and immediately begins the process of cleaning itself of the loathsome filth which is teeming with disease microbes. It combs, brushes and polishes itself long and patiently, sending the dry filth, laden with microbes, in showers over the food, which is subsequently eaten by one or more members of the household.

Perchance the dear little baby is lying sleeping peacefully in his cot. A fly, laden with microbes of croup or some other

infantile disease, alights on the little fellow's mouth and forthwith begins sucking some trace of milk from his lips, infecting them with the germs of this or some other disease. Nurse comes along presently with the feeding-bottle. The hungry baby begins sucking the teat, and the microbes, which have been deposited on his lips, are soon in his stomach, or safely lodged in some crevice or fold in the mucous membrane of his throat, there to incubate and subsequently slay him. Possibly, nay! probably, the nurse lays the bottle aside after washing it more or less carelessly. Flies swarm on the teat, infecting it with disease microbes. These are subsequently sucked off by the baby.

The husbandman sows the seed which brings forth a harvest of golden grain to feed and nourish humanity. The fly sows the seed which brings forth a crop of disease and death.

So long as man wilfully closes his eyes to the doings of the disease microbe and its ally the House Fly, just so long will he be victimised. He boasts of his supremacy over all lower animal life, yet the fly and the microbe cripple and slay him in millions, and he meekly submits to this hourly, daily, and yearly onslaught.

Imagine humanity in a vast stream struggling along a road. As they stumble blindly along, individuals are seen to fall by the wayside and perish. Do they die of good ripe old age, like matured apples falling to the ground? By no means. Occasionally such an one is observed, but the vast bulk of those which fall and perish are seen to be babes, youths, maids, men, and women in the prime of life. Why this terrible mortality? I am puzzled, and turn with a troubled mind to the Sage at my side, and inquire the mean-

ing of it. Touching my forehead with his wand I became clairvoyant, and before my eyes, as on a bioscope screen, I beheld a mother, ignorant of the laws of health and hygiene, feeding her children. I saw those children growing up to manhood and womanhood with weakened constitutions due to lack of sufficient physical exercise ; worrying over tasks when they should be asleep in bed ; eating between meals, and of indigestible and harmful foods and drinks. I saw them as young men and women going forth, one as the mother of a home, the other to earn the wherewithal to keep the occupants of a home in comfort. I see armies of microbes seething in the gutters, in garbage barrels, in filth everywhere. Again I see the House Fly, ever and anon, flitting into that home, and upon it cling swarms of disease microbes.

The scene changes, and I behold the mother dying, with her mourning husband and children around her bedside. Years go by and I again look into that once happy home, and find the father has already been smitten, and is slowly dying of tuberculosis, and there is but one child left of five. Turning to the Sage in sorrow, I ask why man should be afflicted thus. He replied, " My son, there are God-made laws governing every department of life. If these Laws of God are violated, whether ignorantly or wilfully, the consequences are the same. Those parents possessed physical bodies, weakened in every part by long-continued abuse of the laws of Hygiene and Health. Consequently the natural defences or disease-resisting powers, which in robust, healthy bodies are able to, in most instances, repel the attacks of disease microbes, were too feeble to resist their onslaughts. " So long," proceeded the Sage, " as men and women are

content to remain ignorant of the laws of hygiene and health, or deliberately refuse to conform to those laws, just so long will they fall prematurely by the wayside of life, slain by their own neglect, for there is no excuse—there are thousands of popular books by eminent medical and other scientific men, from the pages of which the secret of how to live in health to a ripe old age may be gained.”

CHAPTER IV

THE House Fly not only carries the microbes of various diseases on its feet, legs and body, but it actually carries them inside of its body. Flies feed greedily on the most loathsome of substances—the more filthy the food the more does the fly relish it. It will abandon the choicest of foods usually found on a lunch table for the slops of a sick chamber, the contents of a garbage box, a rotting carcass, or for sputa spat out into the gutter by diseased persons.

At a single meal a fly will swallow nearly half its own weight of food, which is rapidly digested. The House Fly is a glutton, eating at frequent intervals during the daylight hours.

When a fly makes a meal of some form of liquid filth, such as pus coughed up by a person suffering from consumption, bronchitis, influenza, &c., the disease microbes, which are swarming in it, are also swallowed. *These disease microbes are not killed by the gastric juices of the fly. They pass through the body unchanged.* This is a very important truth to bear in mind—as important, or more so, than the fact that flies carry the microbes of deadly diseases upon their feet, legs, and body.

Fly specks are the excreta of flies. The fly being a gluttonous feeder, these specks are, in consequence, deposited at alarmingly frequent intervals. The portions of the filth swallowed by the fly which are good for food are acted

upon by its gastric juices, and sufficiently changed to allow of absorption. All the rest of the material, containing the living disease microbes, is evacuated anywhere—it is a matter of utter indifference to the fly where these specks are deposited. Foodstuffs exposed to flies soon become smothered with specks, as may be seen in any unclean housewife's pantry, or in the commoner class of bunshops. This aspect of the fly danger may be considered too repulsive to mention, but we are dealing with an unclean subject, and it is essential to know the ways and habits of this living scourge of mankind, so that we may know just how to combat it.

If there are flies in a house, even with the most scrupulous cleanliness it is impossible to prevent the interior of the dwelling from becoming contaminated with fly specks. Wherever a fly settles, there a speck will, almost to a certainty, be found. The kitchen and pantry being the principal rendezvous of flies, it is natural that the contents of these places should rapidly get smothered with fly specks. The moment any food substance is exposed, flies settle upon it, and within a few minutes there may be hundreds of fly specks on it.

Fly specks, as already mentioned, are the excreta of flies. This fact alone should be sufficient to arouse people from their lethargy in regard to the fly menace, and to see to it that their homes are free from flies ; and moreover that they do not purchase their food supplies from shopkeepers who neglect to screen their wares from contamination by flies. It is a common sight to see swarms of flies on cakes, sweet-stuffs, cheese, fruit, and a host of other food materials exposed for sale in shop windows and on counters.

The excreta of a fly on our food is bad enough, but when we learn that this excreta, in a large number of cases, is seething with living disease microbes, then indeed it is a matter for earnest thought, and prompt action. A single fly speck may contain the germs of any disease man and

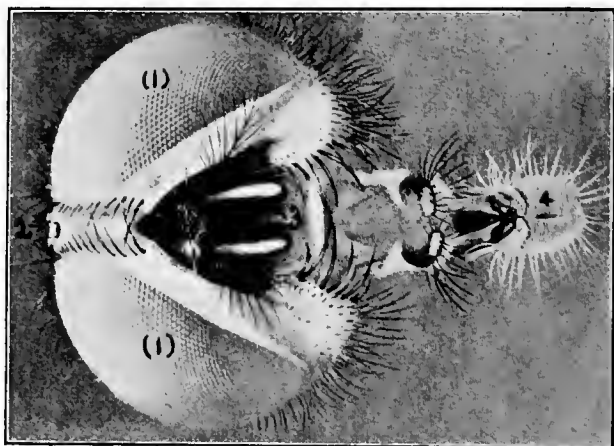


FIG. 9

THE HEAD OF A HOUSE FLY, seen from above.

1. The compound eyes studded with thousands of facets which enable the fly to see in all directions.
2. Three simple eyes in the centre of the top of the head. These give the fly extra powers of vision.
3. The antennæ or "feelers."
4. The proboscis or sucker.

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his domestic animals is subject to. The fly speck may harden by exposure on a plate, a knife, on food, or on a variety of other things, but the microbes in it are by no means dead. They are, for the present, incapable of doing

mischievous, but the instant the fly speck gets dissolved in a suitable substance, they are once again active, and breed with astounding rapidity. A single fly speck is capable of inoculating a man with enteric fever or one of a score or more diseases. You may cover up your food materials

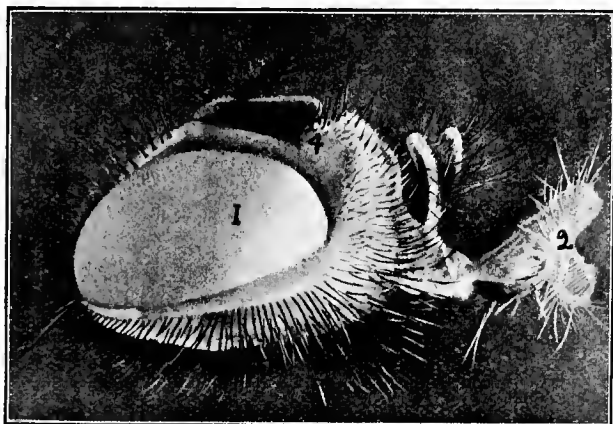


FIG. 10

THE HEAD OF A HOUSE FLY, seen in profile.

1. The large compound eye. 2. The proboscis or sucker.
3. The top of the head. 4. The front of the head.

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with the most scrupulous care, but so long as there is a single fly at large in the house, there is a danger of infection, not only by microbes which harbour in fly specks, but also in the following way.

When a fly sucks up its food hurriedly, as it usually does when feeding upon filth, owing to the competition of swarms of other flies, each eager to get a share, it invariably wings

its way to the shelter of the nearest house. Settling itself comfortably on the cheese, the corner of a slice of bread, on an apple, a piece of cake, the rim of a cup, or some other convenient situation, it proceeds to regurgitate, or in other words vomit up a droplet of the filth it has recently swallowed. This is carefully deposited on whatever the fly is resting upon. Then the proboscis is protruded, and the fly sucks it up again. A small portion, however, is left, and this may contain many hundreds or thousands of disease germs. On examination of a pane of glass in the kitchen window it will be noticed that there are small stains and larger ones. The former are fly specks or the excreta of flies ; the latter are the regurgitated drops, or what is left of them, after the fly has sucked them up.

Repeated experiments have been made with a view to ascertaining the number of specks and regurgitated drops deposited by a fly within a given time. The following is an instance. Ten flies were captured, and after being given a feed of milk, were transferred to fresh clean cages. They deposited in the form of specks and by regurgitation, forty-one spots within the first hour ; sixteen in the second and third ; twenty-four in the fourth ; twenty-four in the fifth ; and fifty-nine in the interval between the sixth and twenty-second hour. When flies are kept captive and food placed in the cage, the spots were twice as abundant. Ten flies could therefore soon smother the interior of a house with disease germs.

Through lack of knowledge we frequently do ourselves and others grievous injury both morally and physically. Every mother naturally desires her children to grow up strong and healthy. Should one of them be unwell, her

mother-nature is aflame, and she does everything in her power to coax the loved one back to health. The father, meanwhile, although saying little, goes about his daily work with a heavy heart and anxious mind. Should the home be robbed of the little one, then there is anguish and misery from which the fond mother sometimes withers and dies. Perchance it may be the breadwinner who is suddenly cut off, leaving a widow and houseful of orphans. We cannot say in these cases that anyone in that household is morally guilty of the death of one of its members. But after learning that the House Fly is the principal agent in the spreading of the microbes of disease, and knowing exactly how it becomes infected and the way it inoculates our foodstuffs, &c., with these fearsome germs, then if every possible effort is not made to keep the house free of flies, *those responsible in that house are morally guilty should one or more members sicken and die in consequence of infection conveyed into the dwelling by flies.*

A man may pray to God ever so earnestly for food, for instance, but he surely does not expect that the food will drop into his mouth, or be miraculously dumped down before him. A way may be opened up to him by which he can obtain his requirements if he is disposed to exert himself mentally and physically.

He who seeks knowledge will find it. Knowledge, however, is of no avail unless it is practically applied for the good of the individual, other members of the home, the community and the state. A man possessing knowledge of practical use to his fellows, and who seeks not to make some use of it for the good of others, is of little value to the community.



FIG. 11

THE UNDERPARTS OF A HOUSE FLY, showing the hairs to which the germs of diseases cling. (Enlarged.)

(From *National Geographic Magazine*, Washington, D.C.
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The House Fly carries the germs of disease upon its body and within its body. The germs which adhere to the body, head, and legs are transferred to man and beast by direct contact, or indirectly by reason of the infection of food material. The disease germs which are swallowed when the House Fly feeds upon its favourite foods, which are the most loathsome kinds of filth, pass through the alimentary canal and are deposited on food, or on various articles such as those we frequently handle. These fly specks, as likely as not, are swarming with germs, and they thus become a grave source of danger to man and his domestic animals.

On the contrary, the cousin of the House Fly, known as the Blood-sucking Fly, of which there are many species or kinds, transmits disease to man and beast in quite a different way. A Blood-sucking Fly is provided with an apparatus by which it pierces the skin of a man or animal and feeds on the blood by sucking it up through the wound made by a sharp lancet. Should the blood which it sucks up be infected with the microbes of disease, then the fly at once becomes dangerous, for the reason that some of the infected blood of its host adheres to and dries on its lancet. If the fly should subsequently feed upon a healthy man or animal, this infected lancet conveys the disease germs into the blood, and should the germs be of a nature capable of producing disease, then in all probability they will succeed in breaking down the natural resistance set up by the body of the victim, and induce a disease according to their kind.

Nagana or Tse-tse Fly Disease is in this way conveyed to domestic animals, and the dreaded Sleeping Sickness to man.

The wise men who framed the laws and regulations for

the well-being of the Children of Israel during their famous march through the wilderness, seemed fully aware of the danger of life and health by the presence of the House Fly, as will be seen on reference to the Hebrew Scriptures.

In the eighth chapter, 24th verse of Exodus, there is the following : “ And there came a grievous swarm of flies into the house of Pharaoh, and into his servants’ houses, and into all the land of Egypt : the land was corrupted by reason of the swarm of flies.” Then in the following chapter a murrain of beasts is recorded. “ Behold the hand of the Lord is upon the cattle which is in the field ; upon the horses, and the asses, upon the camels, upon the oxen, and upon the sheep.” Following this we find it recorded that the first-born of the Egyptians were stricken with death. We can reasonably assume that flies carried the disease germs of various plagues throughout the land, with the result that the inhabitants and their domestic animals suffered appallingly.

A writer named Sydenham, who is stated to have lived between 1624 and 1689, although knowing nothing of disease germs, or how diseases were spread about, was nevertheless of a very observant nature, for he noted that when flies were plentiful during the summer months, there was a corresponding increase in diseases in the autumn. Knowing what we do to-day about the microbes of disease, and the habits of the House Fly, we are aware that an abundance of flies during the summer will certainly mean a considerable increase in the number of cases of illness and death in the autumn. When we have an extra hot summer, we invariably attribute the increase of sickness and deaths in the community to the effects of the heat ; whereas the

fact is that, owing to the increased temperature, House Flies have been enabled to breed with greater rapidity, and in vaster numbers, and are consequently more potent in spreading infection.

The Japanese surgeons were fully alive to the dangers entailed by the presence of House Flies, for, during the Japanese-Russian War, they took the most elaborate precautions to protect the sick and wounded men from these dreaded carriers of disease. At the same time every possible means was taken to prevent the breeding of flies by the prompt burial of the dead men, horses, and camp refuse.

Flies have been captured at random in the dwellings of man and about the streets and subjected to a careful examination under the microscope, with the object of ascertaining the number of disease microbes they carried. The number of microbes on each fly was found to average from five hundred to about six millions. The average for four hundred and fourteen flies showed over a million microbes per fly. Think of it! the hundreds of House Flies which you harbour in your dwelling may, each of them, have a million germs of one or more serious diseases on their bodies, and inside their crop and digestive organs.

The exact way by which this average was obtained was to drop the flies into a bottle of sterilised water, and after shaking the liquid, the bodies of the flies were removed and a portion of the water examined under a microscope, and the bacteria counted. In this way the same average number of microbes would be contained in the water as would be found in milk after a similar number of flies had accidentally fallen into it.

It would be well for mothers to remember the fact that

a single fly is capable of infecting a jug of milk with a million microbes of any infectious disease from which mankind suffers. Nothing short of boiling for, sometimes, as long as fifteen minutes, will destroy the germs of disease with which any fluid, such as milk, might become infected after a fly falls into it. The usual custom is simply to remove the flies and use the fluid. It is an everyday occurrence for a couple of love-making flies to drop into a cup of tea or coffee, and to see them removed with a teaspoon and the fluid imbibed.

It is anything but a pleasant thought to think that when taking your soup, a cup of milk, tea, coffee or other fluid, you are at the same time taking a dose of a million of more of the germs of enteric fever. It is indeed fortunate for us that the stomach and intestines, when in health, secrete fluids which are strongly antiseptic, otherwise the human race would long since have been extinct.

A plate was taken by an experimenter and covered with a thin layer of gelatine. A fly was captured at random, and after clipping its wings it was allowed to walk across the plate. On subsequent examination it was discovered that a colony of disease germs had grown wherever the fly had touched the gelatine with its feet.

It has been found that the spores of a fungus which attacks sugar cane is carried on the feet of House Flies ; therefore this fly is not only a danger to man and animals, but to plants as well.

Now, these facts are more important than they may seem. It means that flies can and do transfer the microbes of various diseases from the slums to healthy sanitary homes, and from sick people or animals in one part of the town to

healthy ones in other parts, perchance a mile or more distant.

It must also be remembered that in a considerable percentage of cases of typhoid fever, the patient, for weeks and even months after convalescence, and long after he has returned to business, still excretes the typhoid germs in both excrement and urine. There are also many people who are attacked with typhoid fever in a mild form and who are not sufficiently unwell to take to bed. Then again there are individuals who are immune to typhoid fever, but in whose systems the microbes live and thrive, making them a constant danger to other people in the community. It will thus be seen that in spite of the most careful isolation of a typhoid patient and the thorough disinfection of all infected matter, this dreaded disease may, nevertheless, be spread by those who have recently recovered from a bad attack, and by examples such as the other two instances cited. Therefore in the case of typhoid fever, nothing short of the strictest sanitary precautions and the extermination of the House Fly will eradicate the disease from a community.

When a case of enteric fever, otherwise known as typhoid, occurs, the originating cause is usually attributed to some defective drain, a manhole, or sluit, giving forth bad odours, &c. These unpleasant odours do not infect people with disease. The frequent breathing of air rendered impure by foul gases will certainly lower the standard of health and prepare the body for infection by disease germs, but actual infection is not caused in this way. Most diseases take several days, sometimes as many as ten and more, to incubate, and in the interval the victim is unaware that in

a short while his temperature will rise and he will be in the throes of a struggle for life. It is generally supposed that infection and the onset of symptoms of disease follow each other after a very short interval, but this is not so. The microbes need time to multiply and produce the poisons which give rise to the symptoms by which we diagnose the nature of the disease. In the case of typhoid fever, for days before the onset of the characteristic symptoms of the disease, the victim is a source of infection to others, chiefly through the agency of House Flies.

Although milk and water are at times sources of typhoid infection, the House Fly constitutes the greatest source of such infection. It has been shown that a fly which has recently fed upon matter infected with typhoid germs not only carries the infection on its feet and body, but that its excrement is a seething mass of typhoid germs. When it is realised that a fly deposits its excrement on every kind of food substance in shops and dwellings, it can easily be understood how flies spread the infection of this dreaded disease.

Typhoid fever is described by Dr. Sedgwick as "a disease of defective civilisation." Typhoid fever can be practically eliminated from a community by thorough up-to-date sanitation and the destruction of flies. The cause of the disease is a microbe (*Bacillus typhosus*), and the sources of infection are the stools and urine of those sick with the disease. It can thus easily be realised what a terrible danger the House Fly is as an agent in the spread of this disease. If the excrement of those suffering from typhoid or those convalescent of the disease is accessible to flies, they will most certainly spread the infection throughout

the neighbourhood. The remedy is to protect infected material from flies, to thoroughly disinfect it, and to wage unceasing war on the flies. When a case of typhoid is known, all those in the neighbourhood should regard the House Fly as a likely means of infection, and should take energetic measures to eliminate it from the dwelling, and to protect all foodstuffs from contamination by it.

CHAPTER V

It must not for one moment be assumed that House Flies are only capable of carrying the microbes of diseases within a very restricted area. Flies may be carried two or three miles by a high wind, and they have frequently been observed to travel a mile and more on a calm day. That they fly from house to house, and often over a wide area, has been satisfactorily proved by careful experimentation. Flies were captured and dipped into a certain chemical solution and released. Then after the lapse of a day or two, flies were collected in various neighbouring localities. These were dipped in another solution, which had the property of turning the flies previously dipped a brilliant blue. It was in this way demonstrated that flies travelled considerable distances.

In towns, flies are transferred from one locality to another by various vehicles, domestic animals, &c., to which they cling, or which they persistently follow, attracted by some appetising odour.

When there is sickness in a house, those responsible should make every possible effort to free the dwelling of flies, because at such times they are especially dangerous, for they not only carry the microbes all over the house and on to foodstuffs, but they are also likely to carry them to neighbours' houses.

Therefore, knowing that flies are the principal agents in

the transfer of disease microbes from infected matter, or sick people to healthy ones, it is a moral duty to at once exterminate all flies in households where there are sick people. Many a father and mother are guilty of the death of one or more of their children, or for serious disease and

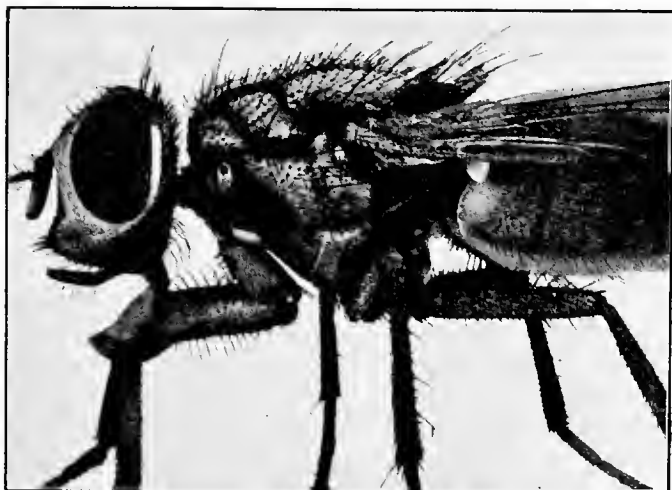


FIG. 12

SIDE VIEW OF A HOUSE FLY.

(From an enlarged model by Mr. Ignaz Matusch in the American Museum of Natural History, Washington.)

death in others outside their home, by their failure to recognise the fact that House Flies carry infection. It is said, "Man will venture where angels fear to tread." This old saying is only too true, but he does so, not realising the risks he takes. People unconsciously take the most appalling risks. Knowledge gave us the mastery of the

world, and in the degree that we seek for and apply knowledge in our everyday lives, so will we just in that degree be able to roll back the tide of Nature's adverse forces.

Careful observations have been made in America in regard to flies and typhoid fever. It was found that when a case occurred in a house, and where the family acted on the physician's advice and exterminated the flies, and of course also observed the ordinary precautions in regard to the disinfection of the stools and urine, it was found that, with very few exceptions, no other member of the household contracted the disease. On the contrary, in those households where the same precautions were taken in regard to disinfection, but where flies were not destroyed, it was quite common to find that two or more members of the household had contracted the disease.

There is a very large mortality in South Africa from dysentery and diarrhoea. The latter is not usually serious when adults are affected, but is a very grave disease to infants and is responsible for a considerable percentage of deaths. The House Fly is largely responsible for epidemics of these diseases. The effluvia given off by the frequent evacuations of the patients attract swarms of flies, which feed greedily on the infected excrement. *So acute is the fly's sense of smell that it can unerringly find the smallest speck of infected matter*, and if dry, it exudes a little fluid from the end of its proboscis on to it, prior to sucking it up. However careful a nurse may be in disinfecting the stools, a great deal of infected matter is bound to escape observation, or is not reached by the antiseptics used. Should flies be present, it is devoured, or a portion of it adheres to the sticky hairs on the pads of the feet, and thus the virus

is carried to other members of the household, or to people in the neighbourhood.

Careful experiment and observation have established the fact that House Flies sow the microbes of nearly all diseases to which man and his domestic animals are subject. Knowing this, we have a powerful weapon against the disease microbe army if we care to use it. We know diseases are produced by microscopically small forms of life, known variably as microbes, bacteria, and germs, and we now know the ways by which they infect men and animals. We know that the House Fly is the principal ally of the disease microbe in its attacks. Knowing this, we should be foolish indeed if we did not at once act upon the knowledge and wage war, yes, a yearly war, against the House Fly. We must be content to fight, and to continue the fighting. Every spring our armour must be buckled on and not laid aside till the cold of winter sets in. The battle will be keen and long, but it must be fought.

Are you content to tarry by the wayside of life blindly taking preventible chances of infection and premature death? If so are you, too, content to indifferently stand by and allow innocent children, mothers, and fathers, to be stricken down, and not lift a hand to save them? Knowledge brings many obligations. Knowing that we have a terrible enemy in our midst, it is our duty to ourselves, our families, and the community to wage war, unceasing war, till the enemy is annihilated.

Our folk are falling daily, smitten down by microbes carried to them by the House Fly. Therefore, Arise and Smite—slay without mercy. Let your battle cry be, "Death to the Fly."

All forms of vegetable and animal life have their natural checks, preventing their species from unduly increasing. The world is a battle-ground where every plant and animal is strenuously fighting for life, and at the same time putting forth every effort to multiply its species. The study of botany and zoology makes it clear that there is a guiding, directing, moulding power or Intelligence permeating all life ; and through the slow process we term Evolution the various forms of life are made more complex, and in the process intelligence is evolved.

It follows, therefore, if the natural enemies of any species of plant or animal diminish unduly in numbers, the balance of Nature is upset, or in other words a hitch more or less serious in the machinery of Nature occurs.

Prior to the advent of Man as the dominant animal, Nature invariably righted herself whenever the balance was upset in the plant and lower animal world. Man, however, has taken the matter in his own hands and seeks to control the forces of Nature, and to intelligently direct them to his special advantage. In so doing he makes some terrible blunders. This is mainly due to the fact that he, as a race, does not control all his actions by an educated intellect. For instance, he indiscriminately slays, or allows to be slain, hosts of animals which are his most valuable allies. This in some instances is prompted by mistaken notions that the creatures are noxious. The chief impelling motive, however, is the gratifying of the destructive instinct—the desire to kill, which is a survival from our barbarian ancestors. Often such actions arise from pure thoughtlessness due to lack of some special form of knowledge. For instance, our womankind, in order to look smart and pleas-

ing to others of their kind, wear the plumage of wild birds, which are exceedingly useful allies in our war against insect and other pests. No thought is ever given to the fact that, in order to obtain this plumage, hosts of lovely birds are brutally done to death, and nestling birds allowed to perish miserably of starvation.

Knowing that the House Fly is the chief ally of our dreaded enemies the disease microbes, surely our first endeavour should be to learn what creatures are the natural enemies of this terrible carrier of the seeds of sickness and death to us, and to our domestic animals. It is not sufficient to ascertain what species of animals, reptiles, and insects are our allies. If we are guided by an educated intellect, we will go further and practically apply the knowledge, by not only making it unlawful to kill or injure these allies of ours, but we will teach the facts to our children; and the only thoroughly efficient way to do it is to have it taught in schools and in the lecture hall. It may be urged that it is a duty of the parents to do this. It may be so, but the fact remains that, with but few exceptions, parents do not possess this form of knowledge, and even if they did, they would not take the trouble to instruct their children. In the meantime the people of the community and the State as a whole suffer.

We will now briefly mention some of the natural enemies of the House Fly.

A fungus, known as *Empusa muscoe*, attacks and kills flies. It is particularly active in the autumn. Having increased and infected large numbers of flies during the summer, it destroys its victims and thus prevents them hibernating and increasing during the following summer

season. Flies are often seen crawling about on window panes in a sluggish manner, and, if caught and microscopically examined, will frequently be noticed to be infected by this fly-killing fungus, the spores of which destroy them.

Flies are the hosts of a variety of external and internal parasites, but these, as a rule, only tend to somewhat deplete the vital forces of the fly, and are not of much practical account in the destruction of these pests.

The spider is another natural enemy of the House Fly, but it is of little practical value as an ally to us in the war of extermination against the House Fly which enlightened communities of men are undertaking.

If we allowed the House Spider to spin his webs without interference in our dwellings, a considerable number of flies would be done to death, but no tidy housewife would tolerate spiders' webs in her home. However, there is no excuse for destroying spiders and their webs in our gardens, except under exceptional circumstances.

There are many kinds of ground spiders which do not spin webs, but which, nevertheless, prey largely on flies by springing upon them from lurking places. Spiders are carnivorous, and prey upon a variety of insects which are harmful to man, and they, in consequence, should be regarded as valuable allies.

The eggs, maggots, and chrysalides of flies are devoured wholesale by an army of enemies—such, for instance, as carnivorous beetles, centipedes, and ants.

There are certain kinds of flies which are very tiny. These little creatures are active agents in keeping House Flies in check. They are ever on the alert to find fly maggots or the chrysalides, in which they deposit an egg. This egg

hatches out into a grub which feeds upon the juices of the fly maggot or the chrysalis, and anon issues forth as a winged insect, having devoured its host. This may be observed by anyone with Ichneumon Flies. The female seeks out a caterpillar of a butterfly or moth, and, puncturing the skin with her ovipositor, lays one or more eggs in her host. These eggs hatch out into grubs which feed upon the internal juices of the caterpillar. The latter, however, does not die until it changes into a chrysalis, otherwise known as a pupa. By this time the grubs of the Ichneumon Flies are full grown and also change at the same time into chrysalides and, behold! instead of a beautiful butterfly or moth emerging from the chrysalis, half a dozen or more Ichneumon Flies issue forth and fly away.

Amongst reptiles, our greatest allies are lizards. All the smaller lizards greedily devour flies and other insects noxious to man. The chameleon is the finest fly-catcher of all its reptile brethren. It has been specially evolved to keep flies in check. The tongue is bulbous and sticky at the point, and lies contracted within the chameleon's mouth. Advancing silently hand over hand on a twig, it stalks a fly, and when about six inches from it, the chameleon pauses. The mouth is seen to slowly open, the careful watcher imagines he sees a momentary flash, and notices the fly has vanished. What occurs is this: the chameleon shoots out its tongue, and the aim is so unerring and so exact that the sticky tip of the tongue merely touches the fly, which adheres to it and is withdrawn into the chameleon's mouth and swallowed. The chameleon can shoot out its tongue to a distance averaging from six to nine inches.

Chameleons are non-poisonous, and are the most in-offensive of creatures, and being such valuable allies to us



FIG. 13

A CHAMELEON in the act of capturing a fly. It can shoot out its tongue to a distance of six inches or more. The bulbous tip is sticky, and the fly adheres to it.

Flies are the chief carriers of disease microbes to man and beast. Chameleons therefore are valuable allies, and should be held sacred. Their principal enemies are Tree snakes and boys of the humanfolk.

in devouring flies and other noxious insects, they should on no account be killed. To kill a chameleon is a cowardly

and wanton act. If we were alive to our interests we would not only have our friend the chameleon protected by law, but we would offer rewards for the destruction of its deadly foes, the tree-dwelling snakes, which in South Africa are represented by the Boomslang (*Dispholidus typus*) and the Mamba (*Dendraspis angusticeps*). These snakes not only hunt down and devour hosts of chameleons, but they also prey upon our insect-eating allies, the birds.

The great majority of our native birds are valuable allies in the war against House Flies, Fruit Flies, and Blood-sucking Flies.

The birds known as Fly-catchers, Sunbirds (Honey-suckers), Swallows, Martins, Bee-eaters, Drongos, Night-jars, and many others capture flies upon the wing; while hosts of others birds feed upon the maggots and chrysalides of flies. The dainty little bird known as the Willy Wag-tail, which struts about our streets and yards so confidently, is another valuable little friend to us, yet we stand idly by while our children shoot it down with air guns, shy stones at it, and rob its nest.

The partridge, pheasant, quail, guinea-fowl, and domestic fowl tear asunder the droppings of animals and heaps of decaying vegetable matter, and feed greedily upon the fly maggots and chrysalides which such decaying substances invariably contain in abundance.

A small mass of cowdung, a decaying cabbage, a little heap of rotten fruit, or some other form of garbage, will suffice to provide food for many thousands of fly maggots. If poultry are allowed their liberty, they know by instinct just where to search for these fly maggots and chrysalides.

The teaching of Economic Natural History in schools

is a pressing need. Travel where you will, you will find the most absurdly erroneous beliefs in reference to natural history subjects are regarded as facts. Most of these beliefs in South Africa have been handed down by the Kafirs and Hottentots, and through lack of any instruction to the contrary they are passed on from generation to generation as facts.

The boy, believing chameleons and other kinds of lizards to be poisonous, kills them at sight : reptiles are, to him, uncanny, cold-blooded creatures, and are regarded as lawful prey upon which to gratify his destructive instincts. The native birds, which God has evolved for keeping the hosts of insect pests in check, are wantonly shot, trapped, or their nests robbed of eggs or young.

We may be aptly compared to a garrison of men fighting valiantly against the many enemies by whom they are encompassed, and not being able to recognise the allies who are seeking to render them valuable aid, turn their guns upon them and mow them down.

Man's hand has ever been against those of his own kind and against his sub-human friends, who have sought to help him along in his struggle for existence, and towards the goal which evolution is directing him, viz. mental, moral and spiritual unfoldment. His hand will continue to be turned against those who seek to uplift him, until such times as his acts are controlled by a suitably educated intellect acting in conjunction with well-balanced and efficiently trained moral and spiritual faculties.

CHAPTER VI

IN the preceding chapters we have become acquainted with the life habits of the House Fly and its natural enemies which, before the advent of that insanitary creature, Man, were able to satisfactorily maintain the balance of Nature. The House Fly is one of Nature's sanitary service, and in the past its mission in life was to help to keep the atmosphere free of noxious gases which are so prejudicial to the health of all animal life. So acute is the sense of smell in the House Fly that should an animal perish, the effluvia given forth by its carcase attracts the flies for a mile and more around. Swarming over the carcase they deposit their eggs in the nostrils, eyes, ears, and other suitable situations. In a few hours these eggs hatch into maggots which immediately begin to devour the decaying animal. During the terrible cattle plague known as the Rinderpest which swept through South Africa some years ago, I saw on one occasion some hundreds of carcasses of cattle which were literally moving, undulating masses of maggots. Visiting the spot after the lapse of a couple of days, I found the maggots had devoured every ounce of flesh, leaving only the skin and bones. The maggots had changed meantime into chrysalides, preparatory to emerging as fully developed flies. Within the hides of what were once cattle, I saw countless millions of these chrysalides. On another occasion I came across the body of a large

bull elephant which had been mortally wounded by a hunter, and had escaped only to perish of its wounds. Its body was at the time a vast moving mass of fly maggots. Returning the following day to take the tusks I saw a wonderful sight. The wild pigs had torn the skin to pieces, and to escape the heat of the sun, and to find a

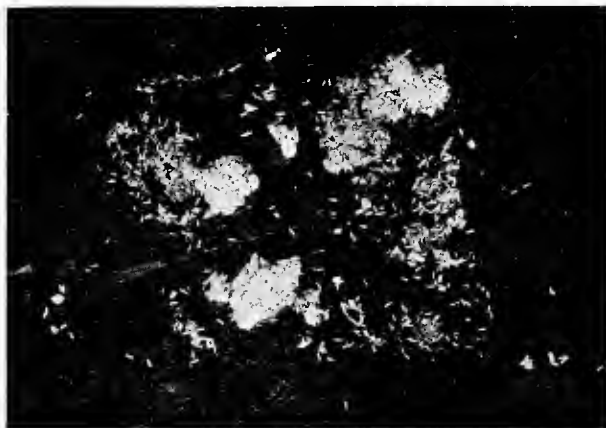


FIG. 14

MASSES OF EGGS OF THE HOUSE FLY such as may be seen on stale meat, garbage, &c.

(By permission of Prof. R. Newstead, F.R.S.)

suitable place to pupate, the maggots were leaving the carcase in a vast procession a foot deep, three yards broad, and six yards long. They were heading for the matted, damp undergrowth adjacent.

When Man made his advent and began to congregate for defensive and offensive purposes into tribes and nations, a considerable number of Nature's scavengers became a

source of danger and trouble to him. The wolf and the hyæna had to go, and so, too, must the House Fly. Its mission as a scavenger is ended. We have cleaner, better and safer ways of having our scavenging done than by leaving it to the House Fly. Our folk in the past have been swept into premature graves in uncountable numbers by various diseases over which they had no control. We have now tracked most diseases to their origin, and we know that they are caused by small forms of life known as microbes. We are, therefore, able to locate the enemy, and by studying his habits and ways we can, if we so desire, attack and defeat him.

There can be no truce with the disease microbe army. It is an army which perchance cannot be annihilated, but it can nevertheless be beaten back and its powers for evil checked. Knowing that the House Fly is the chief carrier of disease microbes in communities of men, and that it is all the time busy sowing the seeds of disease and death amongst us and our domestic animals, it would indeed be folly to regard it with indifference.

The various natural enemies of the House Fly are doing their share in reducing the numbers of these microbe-carrying insects, but wherever insanitary Man congregates, House Flies breed at too rapid a rate for them to successfully cope with. So long as man provides suitable breeding grounds for flies, just so long will he be plagued with them. The Angel of Death will continue to strike down innocent babes, bonnie children, youths and maids, men and women, so long as we are content to tolerate the House Fly in our midst. Arise! combine, organise your forces. Then unite as one man, and smite hard and long. Do not

tarry by the wayside while this terrible fly menace hangs over you like the Sword of Damocles. If you are indif-



FIG. 15
MAGGOTS OF THE HOUSE FLY IN MANURE.
(By permission of Prof. R. Newstead, F.R.S.)

ferent to the chances of disease and premature death yourself, it is no excuse for remaining neutral. You owe a duty to your family and to your fellows generally. By

doing your share in slaying flies, and at the same time ceasing to provide breeding-places for them, you are saving those of your kind from sickness and possibly death. It may be you are the breadwinner. Then think of what it means to your family if you are smitten down with a mortal disease. Even should you be stricken and recover, then try to reckon up the mental sufferings of your anxious wife and children, and the financial losses you incur.

Think of what it means to you if your beloved wife or child should sicken and die—yes, ponder it well, and know that most of this suffering and misery is avoidable. You cannot exterminate the House Fly unaided, but in common justice to others you must do your share. Even should you only succeed in killing a single female fly, you will have accomplished something, seeing that the progeny of one fly in a season will, under favourable circumstances, amount to many millions.

It is quite impossible to exterminate the House Fly until effective and scientific measures are taken to prevent it from breeding. The individuals in a community can, however, keep the House Fly in check if each one will do his share. We should not look to the authorities to do everything for us in this respect. We must do our share in the public interest. If, for instance, you keep cows, donkeys, or horses, it is your duty to see that all manure is either scattered over the ground, and dug into it, removed, or burned, at least once a week. The man who allows piles of manure to accumulate on his premises may easily be many times a murderer without being aware of it, for the reason that he provides one of the finest of breeding-grounds for House Flies, which subsequently sow

the microbes of various diseases throughout the neighbourhood. Then again, we find that many people allow piles of refuse of various kinds to accumulate in their back yards ; their fowl-houses are in filthy condition, fowls and other creatures which may die are buried under a few inches of soil, through which flies can burrow and deposit their eggs on the decaying carcases, and in many other ways breeding-beds are provided for the fly to propagate its kind. In a subsequent chapter the means of dealing chemically with manure, &c., will be described. It is a common sight to see flies swarming over various foodstuffs which are exposed for sale in shops. The public can easily remedy this by refusing to purchase goods from shopkeepers who do not carefully screen all edible substances from contamination by flies. Apart from the dangers of infection and possible death by some form of disease microbe, it is the duty of every shopkeeper to prevent flies from depositing their excrement upon his goods. It is by no means a pleasant thought that when you eat a cake, a sweet, a slice of bread, &c., that you are also swallowing the filthy excrement of flies, or some of the foul contents of this loathsome insect's crop which has been regurgitated, and which, as likely as not, consist of pus coughed up by some diseased person, or the excrement or vomit of animals.

CHAPTER VII

KNOWLEDGE is power only when it is turned to practical use, and it, therefore, behoves us to turn our knowledge of the fly and its habits to practical account and declare war upon this terrible insect, which is sowing the seeds of disease and death broadcast amongst us and our domestic animals. Unfurl your standard, rally your forces, and fight as one man. Yes, fight on, and continue your campaign every summer season until the enemy is subdued.

Then great watchfulness will be necessary, for this is an enemy which is capable of breeding a vast army in an incredibly short time.

It is a moral duty for every householder to keep his dwelling free from flies, for sooner or later disease will ravage his family, and the families of his neighbours.

The storekeeper by neglecting to keep his shop free from flies, or who refuses to screen his goods from them, is morally responsible for any sickness and deaths amongst his customers, who may contract disease through his fly-infected goods.

So, too, the governing bodies of hotels, schools, nursing homes, hospitals, villages, towns and cities are morally responsible for sickness, distress, financial loss and premature deaths of the people if they do not avail themselves of the knowledge they now possess in regard to the disease-spreading power of the House Fly.

The definition of sin is the commission of an act we know to be wrong. If we stood by and saw men being deliberately and wantonly done to death, and made no attempt to save them, we would indeed be made of poor stuff. Yet we stand by and indifferently watch the House Fly infecting men, women, and children with the virus of deadly diseases.

Knowledge brings many responsibilities, and it is as well not to forget the fact. The sins of omission are frequently more hurtful to ourselves and others than the sins of commission.

To fight the House Fly in cities and towns it is essential for the governing bodies to take the lead. The intelligent co-operation of the public is necessary, however. When the people are alive to the danger of the House Fly in their midst, there is no difficulty in getting them to co-operate in a whole-hearted and thorough way.

In starting a fly campaign it is always advisable first to educate public opinion on the habits and disease-carrying powers of the House Fly, otherwise there will be both indifference and active opposition.

An effective way of doing this is through the columns of the local press, suitable bioscope films, and the placarding of the town with illustrated posters, and cards such as the following, which was issued by the State Board of Health of Florida :

THE STATE BOARD OF HEALTH OF FLORIDA

Asks you to carefully and attentively read this card :
then put the question directly to yourself whether flies

should not be destroyed, or, at least an effort be made to keep them from polluting food prepared for you to eat.

Flies are disease carriers.

Live and breed in all kinds of filth.

Infect food and drink by germ-laden feet.

Each female fly can lay 150 eggs.

Should be kept out of dwellings.

(1) Flies breed in horse manure, cow dung, decaying vegetables, garbage of all descriptions, dead animals, and human excrement. Flies are Nature's scavengers, it is true, filling the same function as some bacteria do, but become an intolerable nuisance and *danger* when entering human dwellings and contaminating foods.

(2) The presence of flies is a direct evidence of careless housekeeping and the existence of filth in some form about the premises.

(3) Remember that when and where absolute cleanliness prevails there will be no flies.

(4) Look after the garbage cans. See that they are daily sprinkled with kerosene or lime, and effectively covered. 4

(5) Do the same thing to manure heaps, and remove all manure from stables every three or four days, and when removed, cover with lime and sand. ✓

(6) Look carefully after the cuspidors. They require constant attention. This is particularly true in hotels, boarding-houses, station-houses, railroad stations, and in fact wherever people congregate in large numbers. ✓

(7) Flies are fond of feasting on tuberculous sputum, and hover over cuspidors. The specks of flies contain live tubercle bacilli after they have eaten tuberculous sputum,



FIG. 16

showing that the bacilli will pass through the intestinal tract of a fly in an active infective state.

(8) Flies carry on their mouths (proboscis) putrefying and disease germs on which they have recently fed, and then crawl over food, infecting it, unless shut out by screens.

(9) Keep flies from the *sick*, especially those ill with communicable and contagious diseases. If the room is not screened, the patient should be treated under a net, both for safety to others, as well as for individual comfort.

(10) *Screen all food.* Apply this rule not only to food prepared at home, but to foodstuffs offered for sale, especially fruits, salads; and other things which do not require to be cooked, for—

(a) Flies crawl over fruits when exposed for sale when unguarded by screens, and the generality of people do not wash fruit before eating it. This is a fruitful source of human infection, particularly if a case of typhoid fever near by is being carelessly handled.

(b) Don't forget that flies will carry the bacilli of typhoid fever from the stools of the patient (if left exposed and not disinfected), if given an opportunity, to the food in the kitchen and dining-room. This is no conjecture, for the Spanish-American War proved this fact.

(c) The great secret of how to get rid of flies is *cleanliness first*, and by screening all the openings of the home, especially the kitchen and dining-room.

To permanently eliminate flies from a city, town, or village, it is necessary to remove, cover up, or chemically treat all kinds of rotting vegetable and animal matter, so that the flies will die out by reason of having no places

in which to breed. Destroy their breeding-places and you will get rid of flies. To effect this there must be a thoroughly efficient system of sanitation and rubbish removal, with a set of stringent bye-laws, and a special officer or officers to enforce them. There is no sense in having a law or regulation unless efficient measures are taken to enforce its provisions.

It is a common practice for municipal authorities to remove the town garbage and fill in disused quarries with it, or run it out a mile and dump it down, thus providing one of the finest of breeding-grounds for flies that could be imagined. I know from personal observation that flies breed in these deposits in uncountable numbers, and the majority of them, sooner or later, find their way into the town or village, as the case may be. This vast collection of garbage, it must be borne in mind, is from the rubbish tins and boxes of citizens. It is well known that the most loathsome of filth is thrown into these garbage boxes and cans, including slops and various kinds of infected matter from sick rooms. These rubbish heaps are, therefore, seething with disease germs. It can thus be reasonably assumed that the majority of the flies which breed in such deposits are swarming inside and out with disease microbes of various kinds. The most efficient method of sterilising town rubbish and preventing flies using it to breed in is to burn it, as did the Israelites of biblical times. Another plan is to bury it under at least two feet of soil. A common practice is to simply spray rubbish heaps or piles of manure with paraffin, sheep-dip, or scatter chloride of lime over it. This plan is useless for the reason that it does not reach the fly maggots, and even when it

does reach them, when sprayed over the manure as it is being turned over, it is necessary for it to be strong in order to kill the fly maggots, as they are very tenacious of life, and the insecticide which is capable of killing them must be about four or five times as strong as that used against other kinds of insects.

When paraffin emulsion, creosol preparations, and chloride of lime are used freely and the rubbish heap impregnated throughout, the fly maggots will all be killed. Another plan is to poison the maggots by mixing arsenate of lead, Paris green, &c., with the manure or garbage. When thoroughly applied and in sufficient quantity, these chemicals will effectively kill the maggots, but they must be handled by an intelligent person who thoroughly understands how to use them. The disadvantage of their use is that they are expensive when used freely, and that they are either highly inflammable, corrosive, or poisonous.

Careful experiments by Professor S. A. Forbes, of Illinois, have shown that one of the cheapest and most effective ways of chemically treating manure or garbage is to thoroughly spray it with a solution of sulphate of iron. A gallon of water in which 2 lb. of the sulphate has been dissolved will kill all the fly maggots in 15 lb. of manure, if it is turned over while being sprayed. A gallon of this solution for each horse per day is necessary to prevent the breeding of fly maggots in the manure or to kill them if present.

The contents of garbage boxes, cans, and bucket privies should be sprinkled every day or two with a solution of sulphate of iron of 2 lb. to a gallon of water. The operation could be performed by means of an ordinary

garden watering-can with a fine rose. The sulphate of iron has the advantage of destroying the offensive smell of manure, garbage, &c., in addition to killing fly maggots.

When manure is required for fertilising purposes, sulphate of iron should be used, as this salt in the strength required to kill fly maggots does not seriously diminish the plant-food value of the manure.

A gallon of water in which 1 lb. of borax and 8 oz. of sodium arsenate have been dissolved will destroy all the fly maggots in 15 lb. to 20 lb. of manure or garbage, if sprayed over it while being turned over with a fork: 2 lb. common salt to a gallon of water sprayed on 15 lb. garbage or manure will destroy at least 90 per cent. of the fly maggots it may contain.

CHAPTER VIII

THE time which elapses from the laying of the egg to the emerging of the mature fly is usually from eight to ten days, therefore all town garbage should be removed once a week, it not at more frequent intervals. If the manure is taken out to the town lands it should be dumped and spread in a thin layer with pitchforks. It will then be rapidly dried by the sun, and any maggots there might be in it will be shrivelled up. Ordinary garbage may be treated likewise, but the presence of tins and bottles in it spoil the land and render it unsightly.

When manure and garbage is not destroyed by fire, and cannot be spread out to dry rapidly, it should be thoroughly sprayed with water containing 2 lb. of sulphate of iron to the gallon, or else smothered with chloride of lime. Another solution to the difficulty is to construct fly-tight pits for manure and garbage. Then, when the pit is full, it should be covered over with about two feet of soil. This soil should be beaten down to harden the surface, as flies have been known to burrow through a foot and more of loose soil or sand, and lay their eggs in the filth beneath.

In many towns and villages the citizens are permitted to accumulate rubbish in heaps on the ground, and garbage in any kind of old box, tin, or tub. In the public interest this should be prohibited, for the reason that flies readily

gain access to infected matter, and secondly unless every ounce of the garbage is removed and destroyed, or effi-



FIG. 17
ADULT MAGGOTS AND PUPÆ OR CHRYSALIDES OF THE HOUSE FLY
IN OLD BED FLOCKS.

(By permission of Prof. R. Newstead, F.R.S.)

ciently disinfected, every six or seven days, flies will breed freely in it.

It should be a regulation that householders provide

themselves with a galvanised garbage can with a close-fitting lid, and an inspector should see that this regulation is carried out, and that the cans are in good working order. Manure in a somewhat similar manner may be collected preparatory to removal. For a one-horse stable a large galvanised garbage can or tub with close-fitting lid is sufficient.

In large stables the difficulty can be met by constructing a bin of concrete or thick wood, with a hinged top, and another hinged door or flap at the lower part of the back, from which the manure may be removed. Another plan is to build a fly-proof lean-to shed communicating with the stable by a screened door, and another door on the outer side for the removal of the manure.

In the absence of manure, garbage, or rotting carcasses of animals, flies resort to the tubs in privies if such are available, and after wallowing in the filth, lay their eggs in it and fly off and into the nearest house.

Fly maggots may be destroyed in privy buckets, and flies kept at a distance, by pouring an ounce of paraffin into the bucket twice weekly. Chloride of lime dusted into the bucket once daily is also effective. The lime could be kept in a tin with a perforated top. Any other strong disinfectant will answer the purpose, such as a solution of sheep-dip or carbolic acid.

In South Africa the privy accommodation is, as a general rule, frightfully crude, constituting an ever-present danger to the health and lives of the community. The result of this neglect is that flies breed freely in the stercus. These flies subsequently infect the house and neighbourhood, sowing the seeds of disease and death broadcast. Even

should the flies not be infected with the microbes of various diseases, surely the fact that flies feed on human excreta, breed in it, and wallow in it, is sufficient reason for every possible effort to be made to exterminate them.

The condition of the privies of a large percentage of homesteads on farms, and in many villages and even towns, is too sickening to describe. An inspection of the bucket privies in some towns, and even those which boast the name of city, would reveal a shocking state of things. The privies used by store employees are frequently in a disgusting condition, and the employers should most certainly be prosecuted, for by their neglect they are sowing the seeds of disease and death amongst their fellows. When the bucket system is in use, it is an easy matter to make the privy fly-proof, by having the top part of the door screened with fly-proof netting, and a suitable well-fitting flap at the back for the removal of the excreta.

In all cases where the privy cannot be made fly-proof, the contents of the bucket should be regularly treated with paraffin, chloride of lime, sheep-dip, carbolic acid, or sulphate of iron in powder or in solution with water.

On farms where a pit is usually a substitute for the bucket in privies, there is always a grave danger of soil contamination by infected stercus, as well as the spreading of it by means of the fly, therefore in these instances it is doubly necessary to systematically disinfect the privy.

In all reforms it is not only good policy but a necessity to educate public opinion. If the people are forced to obey a law or municipal regulation and fail to see the reasonableness of it, the authorities will have considerable difficulty, and will frequently fail in their endeavours for

the general betterment of the race. In any case there will be strong opposition and public indifference. In the



FIG. 18

CHRYSLIDES OF HOUSE FLY ON A PIECE OF SACKING. From each of these an adult fly emerges.

(By permission of Prof. R. Newstead, F.R.S.)

course of conversation with the Governor of one of the American States, he referred to the fly danger. His criticisms on the apathy and indifference of the South

African public in regard to the House Fly were sharp and severe. "Why," said he, "you are like an army of men feasting and merrymaking while the sharpshooters of the enemy are busy picking them off in ones and twos and dozens.

"It may interest you to know," he continued, "that the people of my State are now so well educated on the ways and habits of the House Fly and its disease germ-carrying powers, as well as its loathsomeness, that if a fly enters a house it is instantly hunted down and killed. I have noticed in travelling your country that cafés and provision shops are usually swarming with flies. In my State if the people notice even half a dozen flies in a café or in a shop containing edibles of any description, the place is boycotted."

In all communities of men under municipal control it is undoubtedly a plain duty of the governing bodies to abolish the breeding-places of flies. Some years ago malarial fever broke out in Durban. The Corporation took the matter in hand, and by working in a thoroughly systematic way, and by promulgating stringent regulations, and causing them to be strictly enforced, malaria was stamped out. In this instance it was the breeding-places of mosquitoes which were abolished.

Should a serious epidemic such as smallpox, cholera or bubonic plague break out, money is freely spent by municipal authorities in order to cope with it.

Scientific men have demonstrated conclusively that the House Fly is the chief carrier of the infection of a score or more of diseases to both man and beast, and have shown that most of the sickness and premature deaths in

man and his animals can be prevented by destroying the fly which carries the infection. Yet withal, the governing bodies of towns and villages make little or no effort to save the people under their charge from the sickness, financial loss, mental and physical anguish, and premature death due to House Flies. A few illnesses which afflict humanity are caused by morbid changes within the body, such as rheumatism, gout, neuritis, &c., but the majority are caused by the infection of the body from without by tiny organisms known as microbes or bacteria. The House Fly is the principal carrier of these microbes to us, and, like a flock of sheep ravaged by some carnivorous beast, we await our doom.

If men desire to develop their brains, they must use them. The moment a man lapses into mental and physical indolence he begins to degenerate, and Nature, having no further use for him, seeks to kill him off. Thus whole nations of men have been swept off the face of the earth.

In communities of men where the governing bodies are indifferent, or where the measures adopted are not of the most thorough and effective nature, or in small communities and isolated dwellings where there is no governing body, it is essential for each householder to take the matter in hand.

The campaign should be started in the early spring in order to destroy as many flies as possible.

A comparatively small number of flies survive the winter, therefore it is an easy matter to stamp them out, or nearly so, before they begin breeding operations.

Remember, a single female fly can, under favourable conditions, be the parent of about 7,000,000,000,000 flies in a season.

CHAPTER IX

THE greatest of the dangers we have to fear from House Flies is the infecting of our foodstuffs with the germs of diseases. The fact that flies breed in the most loathsome of filth, wallow in it, eat it, vomit and excrete it on our food, should of itself be sufficient inducement to make us use every endeavour to exclude it from our houses. This can be done by screening. Any intelligent carpenter can fit up wire door and window screens. There are many advantages in screening doors and windows in warm climates such as that of South Africa. Mosquitoes and various troublesome insects would be excluded ; the dwelling may, by screening the windows and doors with fly-proof wire gauze, be thoroughly ventilated both day and night. This would prove a great boon to those who fear to keep their windows and doors open after retiring to rest, for fear of burglars and snakes. Air passing through a fine wire gauze is broken up so effectually, that even should a strong wind blow direct against it, the current of air will have its force broken, and there will consequently be no draught in the room. In this way a constant movement of the air in the room will be assured.

Health is largely dependent on a supply of pure air night and day, therefore for this reason alone, all those who can afford it should have their dwellings screened.

The screened frames for the windows should not be screwed on. It is preferable to hinge them, or to fix them

in grooves which will permit of sliding up when it is necessary to clean the window panes.

A solution of formalin is very effective in killing flies. Formalin is sold by all chemists in a 40 per cent. solution. To one part of this 40 per cent. solution add five parts of water. Sweeten with sugar and colour with milk. Instead of sugar and fresh milk, the sweetened form of condensed milk may be added to it. Partly fill a shallow dish with the mixture and place it where flies are most likely to get at it. Flies will drink the mixture greedily and die within a few seconds, often around the dish. Formalin is an excellent substitute for poisons, for a fly killed by formalin is not poisonous if accidentally swallowed by man, beast, or bird, nor is the solution poisonous unless swallowed freely. The dish of formalin mixture should be placed out first thing in the morning, and all other liquids in the room carefully covered up, as flies are hungry and thirsty when they first begin to fly in the early hours of the morning. This covering up of all other foods and drinks is important, and should not be overlooked.

It is advisable to use small dishes and make the mixture fresh each day. Where there is danger of the mixture getting upset, a piece of dry bread may be placed in the dish. This will soak up the liquid, and the flies will suck it from the bread.

Flies usually roost for the night on the ceiling. Advantage may be taken of this fact to kill them by means of fumigation. Before retiring for the night, close up the room as thoroughly as possible. Heat an old shovel, frying-pan, or bit of sheet iron in the fire. Sprinkle a heaping teaspoonful of pyrethrum powder over it. When

this burns, a pungent vapour will rise to the ceiling. Retire and close the door for the night. Next morning the flies will all be lying dead on the floor, and may be swept up.

Pyrethrum powder is the base of the ordinary insect powders. The latter may be used, but they are usually either adulterated, or weak owing to age, or the grinding up of the stems of the plant with the flowers. If these insect powders are employed, two teaspoonsful should be employed for an ordinary sized room. If the flies are not killed after the first experiment with the pyrethrum powder, increase the dosage. Pyrethrum powder is made by grinding up the dry flower-heads of a plant known as the *Pyrethrum cinerariæfolium*. When freshly ground the powder is strongest in its action. The dry flower-heads or powder may be had of any chemist. Failing a supply of the flower-heads or powder, use Keating's Insect Powder.

There are various kinds of fly traps and fly poisons on the market, all of which are more or less effective in ridding houses temporarily of flies. Paper smeared with a resinous sticky substance such as Tanglefoot is excellent. Many people object to its use owing to its stickiness. However, with ordinary care there is no danger of it getting blown with its sticky side on to furniture, the carpet, &c. It ought to be fastened with drawing pins to a piece of board or stiff cardboard, and removed and burnt when it is smothered with flies, or when it gets too dry to hold them.

Flies are fond of sitting on vertically hanging cords. Advantage is taken of this habit to smear cords or strips of tape with bird lime or other kinds of adhesive. These are obtainable from grocers and ironmongers.

The wire cage trap is another effective means of catching

flies if it is suitably baited with a small bit of stale raw meat. The trapped flies may be killed by plunging the trap into boiling water, or holding it over a fire for a second or two. If it is revolved over a piece of burning paper, the flies will all be instantly killed.

The Fly Swatter is a very useful contrivance for killing flies on the wing. It is spade shaped, of wire mesh, with a wooden handle. It is, or should be, stocked by ironmongers. Flies will readily drink a sweetened solution of arsenic placed in shallow vessels about the room. This however, is not recommended where there are small children, or cats and dogs, as several instances of fatal poisoning from drinking such solutions are on record.

The Daisy Fly Killer, stocked by ironmongers and grocers, is an effective fly poisoner.

Mr. P. J. Parrott, Entomologist of the Kansas Experiment Station, in Bulletin 99 of the Station, issued in October 1909, suggested a cheap and effective fly destroyer which is now largely in use in America. The following is his description of the trap :

“The Department of Entomology, after experimenting upon various mechanical devices for catching flies, has contrived a trap and recommended it for trial on account of its effectiveness and cheapness. Anybody with an average amount of mechanical ingenuity can make and attach the trap, with a cost of but a few cents. It is made as follows :

“Take a flat strip of tin $2\frac{1}{4}$ inches wide and $1\frac{1}{2}$ inches longer than the distance between the side rail or stile and middle rail of the sash, as from C to D, Fig. 3, which in this case measured 21 inches. For this window, the

strip must be $22\frac{1}{2}$ inches in length. With the tin lying on the flat surface, bend the tin along the lines ab and cd , Fig. 1, which are $\frac{3}{4}$ inch from their respective sides, so that the space a, b, d, c forms the bottom of a box and the several parts the sides. To close the ends cut small incisions $\frac{3}{4}$ inch

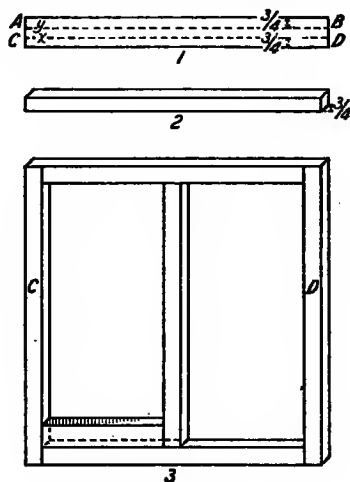


FIG. 19.

A CHEAP AND EFFECTIVE FLY DESTROYER. The explanation of the parts will be found in the text.

(Redrawn from Parrott.)

deep at the points a, b, c , and d , as ay and cx , Fig. 1. Bend the flaps thus made at right angles to their respective parts. We then have a box 21 inches long, $\frac{3}{4}$ inch wide, and $\frac{3}{4}$ inch deep, as at Fig. 2.

"To make the box water-tight, solder the joints, or if solder is not handy try moistened plaster of Paris.

When properly made the box should fit snugly between the middle and side rail or stile. The corners should be square and the edges straight, so as to leave no passage-ways, between the box and the glass. The box should rest on top of the bottom rail, and can be held in place by two or three tacks or pins thrust into the rail from the back side. When the pane is very large it is well to attach another trap half way between the top and the bottom.

“After the traps have been attached, some substance should be put into them that will either kill the insect upon falling into it, or on account of its sticky nature will hold the insect so that it cannot escape. For the first, kerosene, kerosene emulsion, soapsuds, and pyrethrum are the best: and for the second, molasses, or a mixture of castor oil and resin. For general use the soapsuds are to be recommended. When using the liquids fill the traps two-thirds full.

“There should be one trap for every pane of glass of at least one window in the house. For instance, when the sash contains two panes of glass, as in the illustration, there should be two traps, one at the base of each pane. When the sash contains four panes, there should be four traps, two on the bottom rail and two on the cross-bars, or munting. It is not necessary to apply traps to all the windows. Attach traps to one or two windows in the sunny part of the house, and pull down the blinds of the remaining windows. The flies will seek the lighted rooms, and especially the windows.

“When the traps are full of flies, remove them from their fastenings, empty out their contents, and fill them with fresh material.

"A temporary trap can be made of flexible cardboard, following the same directions as for those made of tin. Use glue or pins to fasten the ends. To render the trap waterproof, paint the inside with melted paraffin wax. This will hold any of the above remedies except the pure kerosene."

A cheap and effective means of destroying flies in dwellings, outhouses, or stables is a solution made of one pound of arsenite of soda, 10 lb. of sugar, and 10 gallons of water. Branches of trees with smooth leaves are either dipped or sprayed with the solution, and then hung from the ceiling or rafters. The flies, on settling on the branches, imbibe the solution and die during the night. By this method flies may be killed in vast numbers. The solution may be used with great effect in cattle kraals, which, during the summer months, swarm with flies. In these instances, however, the leaves and branches on which the solution has been sprayed, or which have been dipped into it, must be hung out of reach of the stock, as it is a poison.

In military and other camps, this simple, effective, and easily applied poison can be used with great advantage.

A FLY CAMPAIGN AND THE RESULTS

The remarkable results achieved by the anti-fly campaign conducted by the *Sunday Times*, during October, November, and December 1913, are shown by the statistics compiled by the Medical Officer of Health for Johannesburg for the first four months of that year. The crusade accomplished the death of 61,943,000 flies. This means that there were the following summer season 67,901,083,980,428,722,176,000,000,000,000,000 fewer flies

on the Rand than there might have been if the 61,943,000 had been left alive to propagate their species. The diseases chiefly spread by flies are: enteric fever, diarrhoea, dysentery, tuberculosis, and pneumonia. To take the case of enteric first, the following comparative figures (for the Municipality of Johannesburg—all races) for the first four months of 1913 and 1914 tell a tale calculated to convert the most case-hardened sceptic into an implacable enemy of the fly:

	1913.	1914.		1913.	1914.
<i>January—</i>			<i>March—</i>		
Cases . .	79	43	Cases . .	67	44
Deaths . .	17	3	Deaths . .	13	10
<i>February—</i>			<i>April—</i>		
Cases . .	61	40	Cases . .	65	30
Deaths . .	19	9	Deaths . .	20	4

These figures give the following totals for the four months:

	Cases.	Deaths.		Cases.	Deaths.
1913 . .	272	69	1914 . .	157	26

All the diseases mentioned compare as follows for the months of March and April, 1913 and 1914, the figures given being deaths in the Johannesburg Municipality for all races:

	1913.		1914.	
	March.	April.	March.	April.
Enteric	13	20	10	4
Diarrhoea, &c.	53	33	18	10
Tuberculosis	35	37	27	21
Pneumonia	135	101	18	21
Totals	236	191	73	56

These figures represent for the two months a decrease in

the number of deaths from fly-borne diseases of nearly 75 per cent.

THE HOUSE FLY IN CAMPS

When men live in temporary camps there is always grave danger of epidemics of disease breaking out, and Enteric fever, otherwise known as Typhoid, is one of the chief of those diseases. In the past the causes of these scourges were not understood, consequently epidemics of disease raged in the camps during the times of war. The diseases which cause epidemics have been carefully studied, and we now know that they are caused by microbes, and we have also found out how these microbes are carried from man to man. In the great majority of wars more men have been put out of action by disease than by the enemy's bullets.

In the Concentration Camps during the Spanish-American war in 1898, Enteric, otherwise known as Typhoid fever, and Camp Diarrhœa played havoc with the troops, *and very seriously crippled the army as a fighting machine.* A thorough inquiry was made by a Commission composed of the leading medical men of the United States, with the result that House Flies were found to have been the principal carriers of the infection by swarming over the human fecal matter in the pits, and then visiting the food prepared for the soldiers at the mess tents. It was found, for instance, that officers whose mess tents were protected by screens, suffered far less from infectious diseases than those whose tents were not so protected.

During the Spanish-American war, Typhoid fever was raging in every regiment within three months after assem-

bling in camps. It was equally severe in small as well as large encampments. Infected water was at first thought to be the *chief* cause of the epidemics of disease in the camps, but investigation showed that this was not so. In this, as well as in other inquiries, it was definitely stated that if all the flies were destroyed in well-regulated camps of men, *there would be no epidemics of disease.*

In properly regulated camps no unboiled water is allowed to be drunk unless the source of the supply is known to be pure. In the South African war, typhoid, dysentery, and other infectious diseases made terrible havoc in the ranks by death, and in filling the hospital tents with the sick, and in consequence seriously hampering the movements of the troops. Vast swarms of flies plagued every encampment and swarmed in clouds over the foodstuffs.

Two-thirds at least of the diseases which laid low the men in the various military camps, the people in the besieged towns, and in the refugee camps during the South African war, were caused by the infection being carried on and in the bodies of flies. In turning up a score of recent reports by Medical Commissions on the causes of typhoid, dysentery, diarrhoea, &c., in encampments of men during peace and in war, I find that in one and all the guilt is fastened upon the House Fly.

Knowing that flies are responsible for the spread of disease in encampments, it is as much the duty of every man to fight the fly as vigorously and as persistently as the human enemy. So sure as day follows night, the dark angel of disease will stalk through the camp if his death-carrying agents, the flies, are allowed to swarm over the food and in the tents.

CHAPTER X

THE BITING STABLE FLY (*Stomoxys calcitrans*)

IN the year 1905 a dreadful epidemic of Infant Paralysis or Poliomyelitis occurred in Sweden. It stalked through the land, and eventually spread over the world, both east and west. In 1907 it gained a footing in America. Sometimes one child in a family would be stricken down. In other families all the children were laid low. Parents were almost crazy with alarm and dread, and physicians were utterly puzzled. The disease was beyond them; the cause of this terrible scourge was a mystery, and knowing not the cause, they could not attempt to treat it with any degree of success.

The plague continued to spread, cutting short the lives of thousands of bonnie children, and permanently crippling those who survived. Many remained helpless invalids for life; others, after a long and tedious course of massage and electrical treatment, recovered sufficiently to be able to walk weakly. Many mothers broke down utterly under their load of trouble, becoming nervous wrecks; others actually became insane. Imagine, if you can, a fine, sturdy, healthy son, and a bright, rosy-cheeked daughter suddenly rendered helpless, and after a long, lingering illness emerging mere shadows of their former selves, and doomed to a life of helplessness. The children of rich and poor alike were stricken, and parents watched their loved

ones with aching hearts and the haunting fear that at any moment they might be stricken down, and the pity of

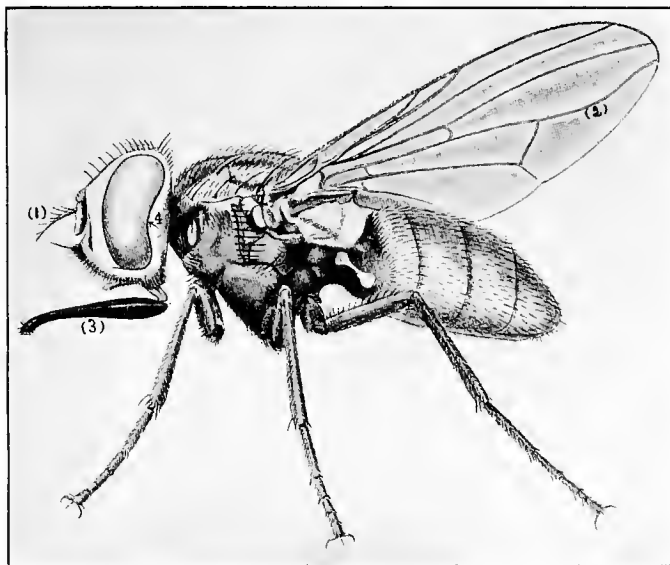


FIG. 20

THE BITING STABLE FLY (*Stomoxys calcitrans*), which transmits infant paralysis. It differs from the House Fly not in size, but in being more distinctly spotted with grey and black ; by the flagellum of the antennæ (1) being hairy on one side only ; by the third long wing vein (2) being less bent than the same vein in the House Fly ; by possessing a hard proboscis (3) containing a lancet, instead of a soft sucking apparatus, as in the House Fly ; by the posterior part of the compound eye (4) being concave instead of straight as in the House Fly.

(Drawing by Mr. Ignaz Matusch in " The American Museum Journal," May 1913.)

it was they knew not from where the blow would be aimed, and consequently were powerless to prevent it falling.

However, after long and patient research by various noble men of science, it fell to Professor M. J. Rosenau, of the Harvard Medical School, to complete the final chain of proof. This occurred in the year 1912. In this connection we cannot do better than quote from the *American Museum Journal* for May 1913 as follows:

"No one who was present at the joint session of Sections I and V of the Fifteenth International Congress of Hygiene and Demography on September 26th last will forget that most striking event of the whole Congress, the presentation of these results. Eminent investigators from Norway, Sweden and Austria, as well as some of the leading workers in this country, had presented the formal papers of the morning. Much that was important was added, but the weight of evidence still seemed to point, though somewhat doubtfully, towards human contact as the chief agent in the transmission of the disease. In the discussion that followed, Dr. Rosenau made a preliminary report of his experiments, and announced that he had succeeded in producing Poliomyelitis (infant paralysis) in six out of twelve monkeys bitten by Stable Flies (*Stomoxys calcitrans*) which had been allowed to feed on other monkeys suffering from the disease. As a result of his discovery the entire outlook for the control of infant paralysis has been changed."

Professor Rosenau's work has since been confirmed by Drs. Anderson and Frost of the United States Public Health Service. There is, of course, no certainty that the disease is *always* transmitted by this particular species of Blood-sucking Fly, but it is well established that this fly is the principal disseminator of the disease,

although infant paralysis can be spread by direct contact between an infected child and a healthy one.

This Biting Stable Fly is thought to have originated in Europe, but it is now found in practically all parts of the civilised world, spread, like the Brown, the Black Rat, and the common House Fly, by the ships of trading nations.

This species of fly cannot be readily distinguished from the House Fly by the careless observer ; but when closely examined it will be seen to differ in some noticeable ways. The proboscis is quite differently constructed to that of the House Fly. In the Biting Stable Fly the proboscis contains a lancet with which it pierces the skin of its host in order to feed upon the blood. On the contrary, the House Fly's proboscis is only adapted for sucking up liquid, or semi-liquid substances, and it is therefore incapable of piercing the skin of man or lower animals, owing to the absence of a lancet. It differs from the House Fly also in being more distinctly spotted with grey and black ; and by the flagellum of the antennæ being hairy on one side only. An examination of the wings of the two species of flies will also reveal a difference. The third long wing vein in the House Fly will be seen to have a sharp elbow near the tip, as shown in the illustration ; whereas in the Biting Stable Fly this wing vein is bent to a much lesser degree at the same place.

The Biting Stable Fly feeds entirely upon the blood of the mammal class of animals, including man. Its favourite victims are horses and cattle, and in consequence it haunts the stables and cattle kraals. Sometimes these flies are so numerous that the horses and cattle are driven almost frantic by their painful bites.

It must not for a moment be assumed that every Biting Stable Fly introduces the germs of some form of disease

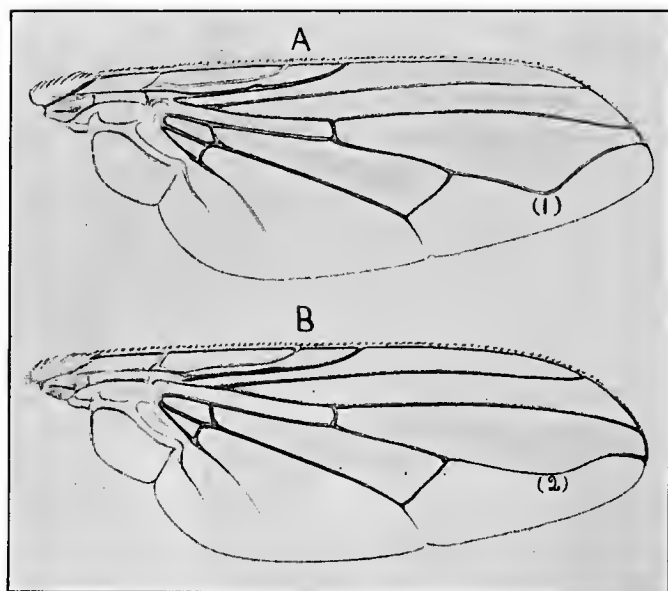


FIG. 21

- (A) WING OF A HOUSE FLY (*Musca domestica*). Note the sharp elbow in the third long wing vein (1) and compare it with the same vein in the Stable Fly.
- (B) WING OF A STABLE FLY (*Stomoxys calcitrans*). The third long wing vein (2) is less bent than that in the wing of the House Fly. It also has a sharp lancet for puncturing the skin of its host. The House Fly, on the contrary, has a soft proboscis or sucker.

(From a drawing by Mr. Ignaz Malausch in the American Museum of Natural History, Washington.)

into its host when it punctures it with its lancet. When the insect sucks the blood of a beast sick with an infectious

disease, some of the infected blood remains on the lancet and dries there ; and when this lancet is subsequently thrust through the skin of a healthy animal, it is likely when withdrawn to leave behind it the infected blood of the sick beast. That this species of fly is a carrier of disease germs from one animal to another in this way, there cannot be any doubt. Where there are plenty of animals on which to feed, the Biting Stable Fly does not, as a rule, gorge itself on one animal's blood. It prefers to sample the blood of several, and is on this account a source of graver danger than it would have been if it contented itself with its fill of blood from a single beast.

The Biting Stable Fly is commonly found in the vicinity of dwellings, but it usually remains out of doors in the warm sunshine, and so long as the atmosphere is balmy and genial. However, at night, or when the weather is chilly, or rain is falling, it seeks shelter in outhouses and dwellings. It will bite a human being as readily as an ox or a horse ; in fact it often specially favours the human animal with its attentions, owing to his skin being so easy to pierce. When reclining or moving about out of doors during the summer time it is a common occurrence for these flies to settle upon the bare parts of the skin. Their presence is quickly made known by the sharp, painful prick which they inflict. Thin clothing, such as a shirt, does not deter them from biting, as the lancet can be readily thrust through such material and into the tender flesh beneath.

The Biting Stable Fly, like the House Fly, breeds in decaying animal and vegetable matter. Its favourite breeding-places are fermenting heaps of hay, straw, and

other decaying substances such as stable manure. It lays an average of sixty eggs at a time, in a heap. These eggs, which are very similar in appearance to those of the House Fly, hatch out in two or three days' time, if the temperature be suitable, viz. 72° F. to 75° F. during the daytime, and if not lower than 65° F. during the night. The grubs or larvæ take from fourteen to twenty-one days to become full-grown if the conditions are suitable. Should the fermenting substances on which they feed become somewhat dry, and if even a little light should penetrate to their feeding-grounds, the development of the grubs is retarded, and they will not reach maturity for a month. Should the conditions for quick development be very unfavourable, they will take nearly three months to mature. After changing into the pupa or chrysalis condition, an interval of from nine to thirteen days passes before they emerge as full-grown Biting Stable Flies. It is believed that this species of fly passes the winter chiefly in a pupal or chrysalis condition.

There can be no doubt that this Biting Fly, and others of the same kind, all of which are generally termed Blood-sucking Flies, are capable of carrying blood parasites from one animal to another, or from one human being to another in the manner already outlined. Apart from its power to inoculate healthy animals, and even man, with disease germs, its bite alone often produces serious results in cattle, for it has frequently been noticed that when such animals are bitten on the legs and shoulders by Blood-sucking Flies the joints become swollen, often so much so that the animals are unable to bend their legs and consequently cannot lie down. Often the inflammation

of the joints is so severe that the skin about the parts cracks and the hair falls off.

There are a large number of species of Biting Flies. Farmers and others living in situations other than towns are all acquainted with one or more kinds. Some species are as large as a Honey Bee. Every species of Blood-sucking Fly should be regarded as an enemy, and in consequence every possible effort should be made to reduce their numbers. Apart from the alarm, unrest, and even terror they cause to domestic animals by their painful bites, as well as to the folk working about the homesteads, they should, one and all, be regarded as possible *carriers of disease*.

One species of Blood-sucking Fly has already been the means of prematurely sweeping into eternity hundreds of thousands of the black people of Central Africa. Another species holds great areas of fertile land secure against the intrusion of the domestic animals of man, and in consequence is a serious check on the expansion of the human race, for no practical development can take place in territories where domestic animals cannot live.

Farmers can do a great deal in the way of checking the increase of Blood-sucking, as well as House Flies. The breeding-places of these terrible pests must be abolished. Piles of decaying straw, leaves, chaff, stems of plants, manure, garbage, &c., should be burned or scattered in a thin layer over the ground so as to expose it to the sun's rays, which will dry it up and kill the maggots of the fly. If required for manure it could be put into pits and covered with a foot or two of soil, or scattered and ploughed or dug into the soil at once.

CHAPTER XI

WHEN cold and hunger were destroying the physical body of that great hero Captain Scott, he, with fingers numbed by approaching death and the intensity of the antarctic cold, wrote to his wife :

“ Make the boy [his little son] interested in Natural History if you can ; it is better than games ; they encourage it at schools. I know you will keep him in the open air. Above all you must guard against indolence. Make him a strenuous man.” Never was better advice ever given. In what finer way can the faculties of the human mind be unfolded than by studying and taking an intelligent interest in the works of the Creator. When we study Natural History we find order, method, and design in every form of matter, animate and inanimate.

Our civilisations are founded on the intelligent study of Nature, yet we have not considered the subject of sufficient importance to teach to our children.

Normal men and women do not deliberately court disease and death. True they take terrible risks, but they do so chiefly because their eyes are blindfolded. They have eyes, but they see not ; ears, but they hear not. They heed not the warnings of their men of science, whose mission it is to scout away in advance and to give due warning of the approach of danger, and the quarter from whence it threatens. Now, if we had an army in the field, and if

we learned that the leaders deliberately turned a deaf ear to the warnings of the scouts, or listened but refused to take any steps to learn if the reports and warnings were true, would not a wave of fierce indignation rise within us against those men ?

People unnecessarily expose themselves daily to grave danger of disease and premature death, but they know it not. They are like pilgrims traversing a bridge across a roaring torrent, and in the floor of that bridge there are many trapdoors of which the travellers are ignorant. Out of a multitude of pilgrims who are pressing eagerly on, but few reach the opposite bank.

So, too, in the race of life ; few reach a healthy old age—the vast bulk lose their physical bodies prematurely. Sages tell us, and we have no valid reason for doubting it, that the present life is but a preparatory stage for the real immortal life in the spiritual world, and it would therefore follow that the longer we succeeded in retaining the physical body the more mature would we be mentally and spiritually on departing from it.

Apart from the metaphysical aspect of the subject, surely it is of the most practical importance to guard the people of a community against premature death.

It is indeed a misfortune to a community and a State for a man to be cut off in his prime when he is, through experience, just beginning to be of real value to others. We consider it a misfortune to lose a well-stocked library, but it is as nothing to the loss of a well-stocked brain—a brain educated by experience and study. Such a loss is not a matter of concern to relatives only—it is of grave importance to the community and the State.

It may be asked, "What has all this to do with House Flies?" It has a great deal to do with them—more than, perchance, is realised. Through lack of an intelligent

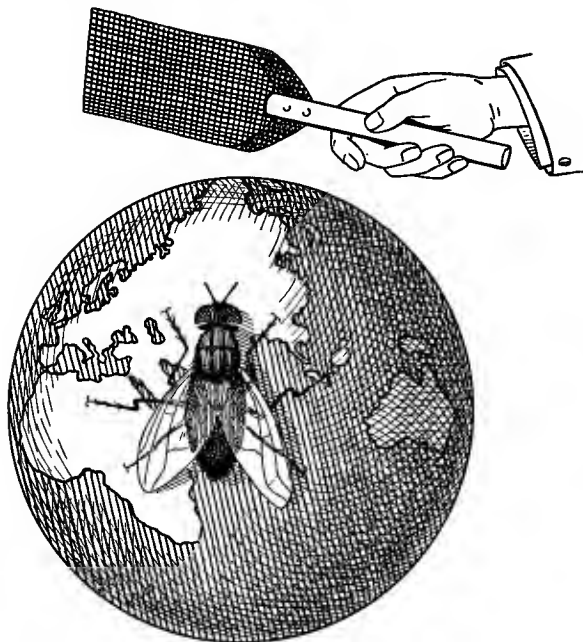


FIG. 22

The House Fly has the world in its grip. Arise! ye leaders of the humanfolk and declare WAR—aye!—war to the death against this terrible enemy which is mowing down the flower of your people.

understanding of Natural History, our children grow up knowing nothing of the rich mines of knowledge which vitally concern them individually and collectively.

An instance in point is that of the House Fly. Through ignorance of the ways, habits, and disease-carrying powers of this insect, we tolerate it in our dwellings ; allow it to sow disease germs broadcast over our food ; to deposit its germ-laden excrement wherever it so desires. In fact we give it the fullest licence to sow disease and death amongst us. It is not because we are fatalists. It is solely because we have not realised that the House Fly is the principal ally of the disease microbe army—the army which is ever on the alert to attack and destroy us.

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